United States
Department
of Agriculture

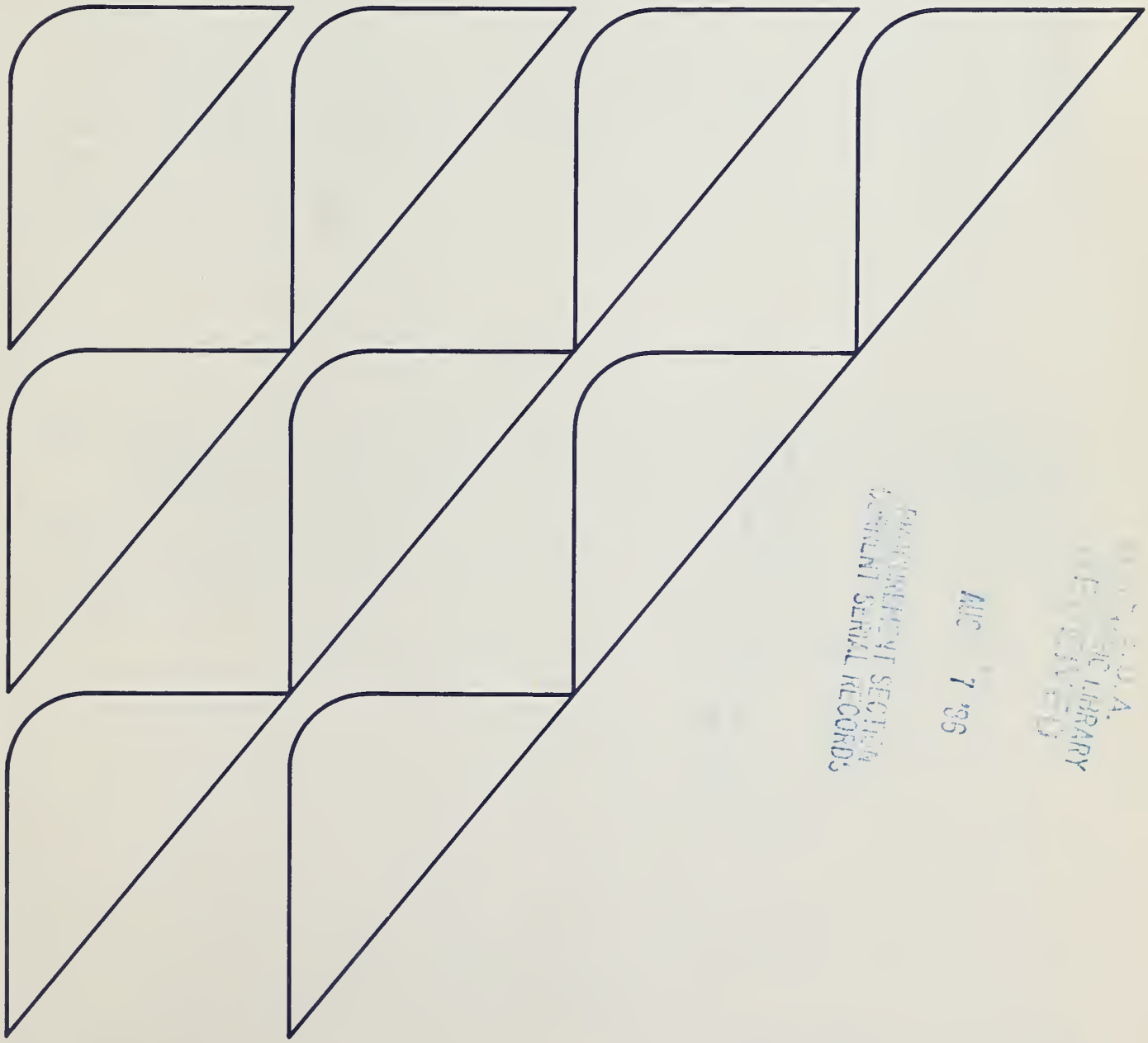
Economic
Research
Service

Bibliographies
and Literature
of Agriculture
Number 48

Economic Gains From Agricultural Trade

A Review and Bibliography

Barry Coyle, Robert G. Chambers, and Andrew Schmitz



ECONOMIC GAINS FROM AGRICULTURAL TRADE: A REVIEW AND BIBLIOGRAPHY. By Barry Coyle, Robert G. Chambers, and Andrew Schmitz. International Economics Division, Economic Research Service, U.S. Department of Agriculture. Bibliographies and Literature of Agriculture No. 48.

ABSTRACT

This report reviews recent theoretical and empirical developments in research on the economic gains from international trade, particularly agricultural trade. According to traditional theory, a marketing situation where no tariffs or other barriers are imposed on international trade (free trade) is always superior to a policy of national self-sufficiency and nonreliance on imports or economic aid (autarky). However, recent literature indicates that these traditional arguments are easily violated under a variety of circumstances. This report analyzes general- and partial-equilibrium trade models that illustrate these circumstances; research on the effects of government intervention on trade gains in U.S. agriculture; and developments in trade model specification, estimation methods, and construction.

Keywords: Gains from trade, agriculture, international trade, trade policy

SALES INFORMATION

Additional copies of this report can be purchased from the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161. Ask for Economic Gains From Agricultural Trade: A Review and Bibliography (BLA-48). Write to the above address for price and ordering instructions. Microfiche copies are available for $5.95 each. For faster service, call NTIS at (703) 487-4650, and charge your purchase to your VISA, MasterCard, American Express, or NTIS Deposit Account. NTIS will ship rush orders within 24 hours for an extra $10. You can charge your rush order by calling (800) 336-4700.

The Economic Research Service has no copies for free mailing.

Washington, DC 20005-4788 July 1986

CONTENTS

SUMMARY

This report reviews recent theoretical and empirical developments in research on the economic gains from international trade, particularly agricultural trade. According to traditional theory, a marketing situation where no tariffs or other barriers are imposed on international trade (free trade) is always superior to a policy of national self-sufficiency and nonreliance on imports or economic aid (autarky). Some individuals gain under free trade while others lose, but the gainers offset the losers. However, recent literature indicates that these traditional arguments are easily violated under a variety of circumstances.

This report analyzes general- and partial-equilibrium trade models that illustrate these circumstances; research on the effects of government intervention on trade gains in U.S. agriculture; and developments in trade model specification, estimation methods, and construction.

Many studies demonstrate that the following situations are contrary to traditional arguments:

- o Increasing returns to scale economies. Two economies with the same technology and relative production factors (resources used to produce a good or service) can still trade and gain if they have increasing returns to scale (a doubling of all inputs more than doubles output) and monopolistic competition (many sellers of differentiated products). But, the economies will not always gain by trading because increasing returns are distortions, and standard trade theory indicates that trade subject to distortions may be inferior to autarky.

- o Dynamic economic settings. Free trade is not inferior to autarky even in a dynamic, or changing, setting. Whole generations gain while other generations lose, but overall, the gains exceed the losses.

- o Foreign ownership of production factors. When foreign interests own the production factors, an economy will not always gain from trade. This argument is particularly relevant to U.S. agriculture. Concern has increased over the degree of foreign landownership in the United States and the significant portion of foreign workers in agricultural industries like the fresh fruit and vegetable sectors.

- o Monopolies. A small economy will always gain by moving from autarky to free trade if its domestic industry is monopolized (only one seller) because the monopoly will be small relative to the world market. The world trade terms will supersede the monopoly's prices and destroy it. This argument does not necessarily apply, however, in the case of large countries. In some cases, a large country would be better off under autarky than under free trade. Moreover, the elimination of all monopolies in international trade may maximize world welfare, but a country may actually lose by the destruction of its monopoly.

- o Uncertain economic conditions. Uncertain economic conditions can affect trade gains. For example, a country's trade volume and gains will be smaller in the case of uncertain world prices, and changes in production factors can affect relative factor prices. In the case of a small trading country's trade fluctuating widely as a result of uncertain transaction costs or

erratic movements in spot exchange rates, autarky will not be optimal regardless of trade term variations.

- o Government intervention in domestic markets. Trade tariffs, quotas, and restrictions can also affect trade gains. For example, the U.S. beef market is protected from foreign competition by an import quota and a voluntary restraint agreement negotiated with U.S. trading partners. The voluntary restraint agreement may actually work in favor of the exporting nations and not the United States. Furthermore, the quota arrangement may involve a significant U.S. loss.

Despite the above arguments, studies indicate that free trade is remarkably robust. Much more research is needed, however, particularly in two areas. First, what is the magnitude of existing potential trade gains and the associated costs of departing from free trade? Because of the dearth of research studies on this topic and the primitive research approaches that have been used, a major goal of research in this area would be construction of workable, yet realistic, tools for such analysis. Second, what are the effects of domestic policy alternatives on trade gains? This area seems particularly important for individuals interested in such sectors as U.S. agriculture where the Government is highly involved.

Economic Gains From Agricultural Trade

A Review and Bibliography

Barry Coyle, Robert G. Chambers, and Andrew Schmitz

INTRODUCTION

This paper reviews recent theoretical and empirical developments in literature on the economic gains from international trade. Letiche, Chambers, and Schmitz already surveyed much of this literature (123), 1/ so we emphasize the most recent developments and literature. For a thorough introduction to the literature on classical gains from trade, see (123).

STANDARD TRADE GAINS RESULTS

The opening of an economy to trade implies that some individuals will gain while others will lose. Two examples best illustrate this point; one from the general-equilibrium Heckscher-Ohlin-Samuelson (HOS) model and one from a partial-equilibrium context. The HOS example is from the Stolper-Samuelson theorem which says that in any economy with two productive inputs (available in fixed amounts) producing two outputs according to constant returns to scale, a rise in a relative output price raises the share in national income of the factor used intensively in the production of the good whose relative price rises (176). The movement from autarky to free trade entails a change in relative prices and, by the Stolper-Samuelson theorem, a change in the factor shares of national income. The factor used intensively in the production of the good whose price falls will see its position in the economy deteriorate, while the factor used intensively in the production of the good whose relative price rises will see its position enhanced. The latter gains at the expense of the former as a result of the introduction of trade.

The standard open-economy supply and demand model is a more concrete example (fig. 1), where P represents price; Q, quantity; and S and D, domestic supply and demand curves for an internationally traded commodity. The market equilibrates at price P_A and quantity OQ_A in a country without trade. If there is trade and the country exports the commodity, the resulting equilibrium is at P_T, where the country produces at OS_T, consumes at OD_T, and exports the amount $S_T - D_T$. Domestic consumers end up paying a higher per unit price for less of the commodity as a result of the introduction of trade. They are worse off, and the area labeled A gives their loss in Marshallian consumer surplus terms. 2/ Conversely, domestic producers sell more at a higher price,

1/ Underlined numbers in parentheses refer to items in the bibliography.
2/ Area A is the area below the demand curve bounded by price P_A and P_T.

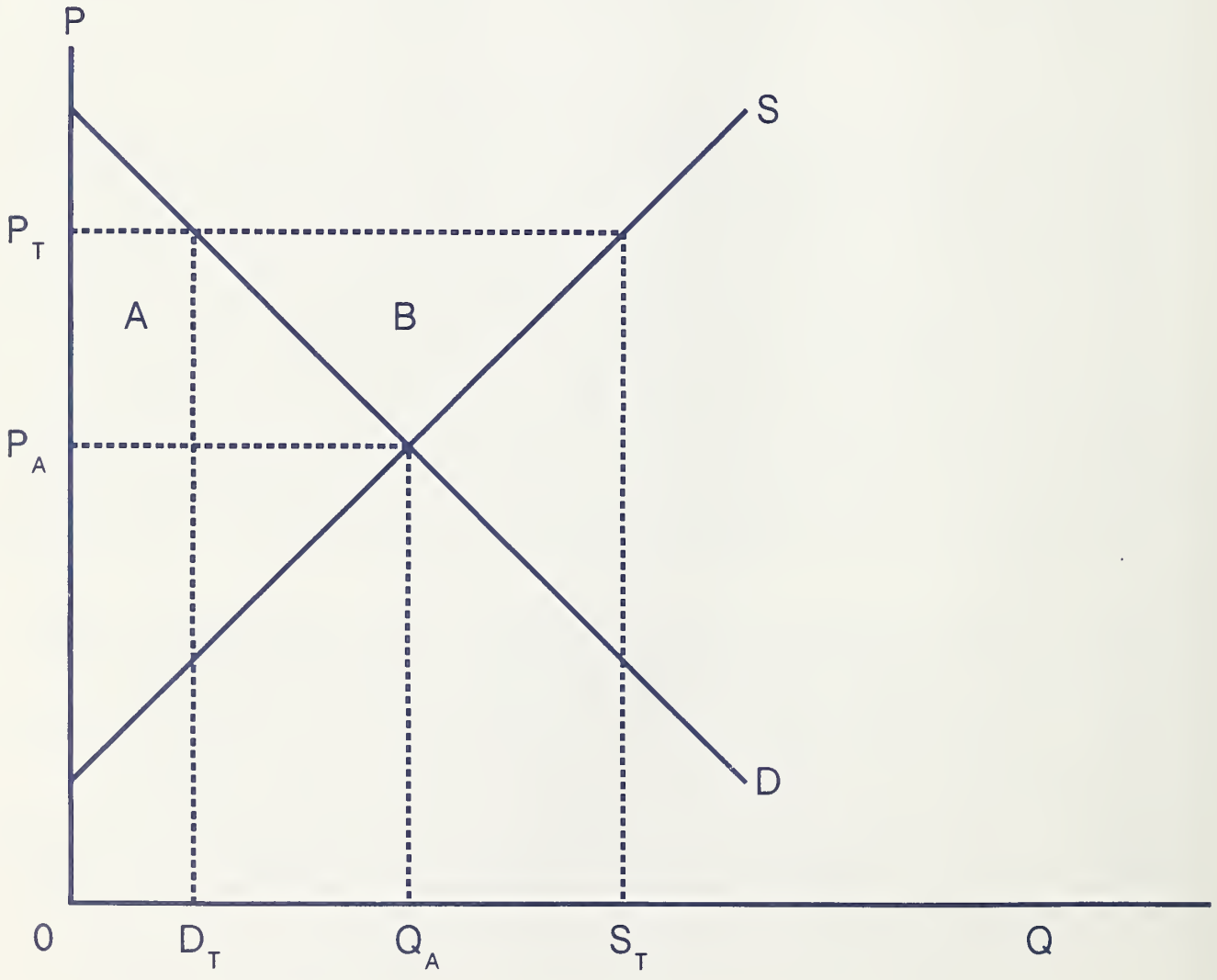
and they are better off. B + A gives producers' gains from moving to the trade position. Hence, producers can transfer quasi-rents in the amount A to consumers and still have B left over if the economy is opened to trade. Thus, although consumers definitely lose as a result of the introduction of trade, the fact that producers could potentially bribe consumers to accept trade is often taken as proof of the existence of trade gains.

This example demonstrates two important aspects of the gains from trade literature: Some individuals lose by accepting free trade, and the argument for free trade rests upon the principle of potential compensation of gainers by losers. Almost all gains from trade arguments are of this latter type. Gains from trade arguments do not imply that everyone is better off, except in very special circumstances. Rather, they imply that potentially everyone could be made no worse off, and at least one person could be made better off.

The partial-equilibrium analysis of trade gains can be extended to the excess supply and demand framework in figure 2. These schedules can be derived from

Figure 1

Gainer and loser from trade

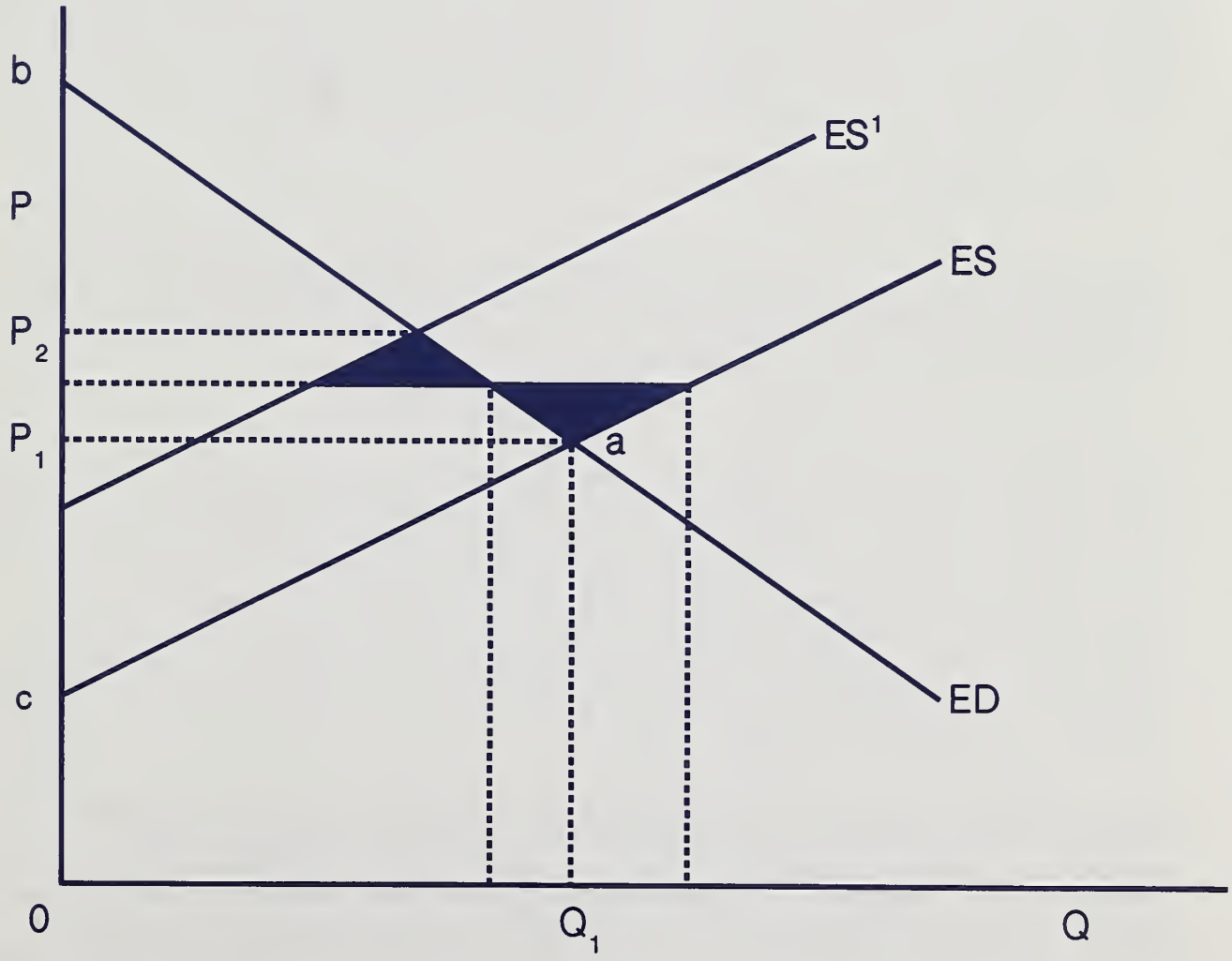


the domestic market supply and demand curves shown earlier. The excess supply curve ES shows the quantity exported at various prices, and ED shows the quantity imported. With free trade, the price is P_1, and Q_1 is the amount traded in international markets. In principle, one can build up to a general-equilibrium framework by specifying excess supply and demand curves for all relevant traded goods. From these, trade gains can be measured, as figure 2 shows. P_1ac is the exporter's gain, and P_1ab is the importer's gain. Thus, the total gains from trade for this one-commodity market are cab.

The literature on the effects of commodity price stabilization has its roots in figure 2. Suppose variations in weather cause excess supply to fluctuate back and forth between ES and ES^1. At ES, price is P_1; at ES^1, price is P_2. Two welfare effects of implementing a buffer stocks policy should be considered: The aggregate effect with both countries taken together and the individual country effect. The two solid triangles equal the gain from price stabilization for both countries together; thus, stabilization leads to additional trade gains. However, one country loses from stabilization and the other gains, but

Figure 2

Welfare and instability in international trade



what one country gains is greater than what the other loses. The importer loses by policies designed to stabilize price unless the exporting country compensates the importer.

This simple model has been modified in many ways by taking into account such components as storage costs. Nevertheless, the model demonstrates an important ingredient common to all the model extensions: There are potential gains exceeding losses from stabilization. With appropriate redistribution policies, all agents can benefit from price stabilization policies. This model raises the interesting question as to who should hold reserves, which is important from a practical policy standpoint. The partial-equilibrium models outlined in figures 1 and 2 have secured an especially important place in agricultural trade analysis. Although the general economics literature on international trade relies heavily on general-equilibrium models, both theoretical and empirical work on agricultural trade have centered on the partial-equilibrium or one-sector model. And most welfare analyses have been carried out exclusively in terms of consumer and producer surplus.

The standard demonstration of the potential gains from free trade, for which Samuelson offered the first rigorous proof (166), hinges on the demonstration that the opening of trade essentially transforms the technology available to an economy. For any bundle the economy would produce under autarky, the economy could trade to obtain a commodity bundle no smaller than the autarkic bundle. To see the argument formally, we introduce some notation and assumptions on the technology. Let outputs and primary inputs be divisible into two separate groups denoted by the respective n and m dimensional vectors $y = (y_1, ---, y_n)$ and $x = (x_1, ---, x_m)$. Technology is characterized by the convex transformation function $T(y,x) = 0$ and its dual revenue function:

$$R(p,x) = \underset{y}{\text{Max}} \, [p.y: T(y,x) = 0],$$

where p is the vector of commodity prices. The properties of $R(p,x)$ are discussed in detail in Dixit and Norman (65). If we let superscript 1 refer to the trading situation and superscript 0 to the autarkic situation, then under competition, we have the following:

$$R(p^1, x) = p^1.y^1 > p^1.y^0.$$

The income generated by the revenue maximizing output bundle always exceeds the revenue generated by the autarkic bundle when income is evaluated at the free trade set of prices. Figure 3 illustrates this point graphically, where TT' is the relevant transformation curve between two commodities y_1 and y_2. If the slope of PP' gives international prices and A is the autarkic bundle, the income that A generates can never exceed the income that the revenue maximizing bundle generates. Put another way, the existence of trade expands the technical possibilities to PP'0 as opposed to TT'0 that is available under autarky. Hence, any commodity bundle that is available under autarky is always potentially available with free trade.

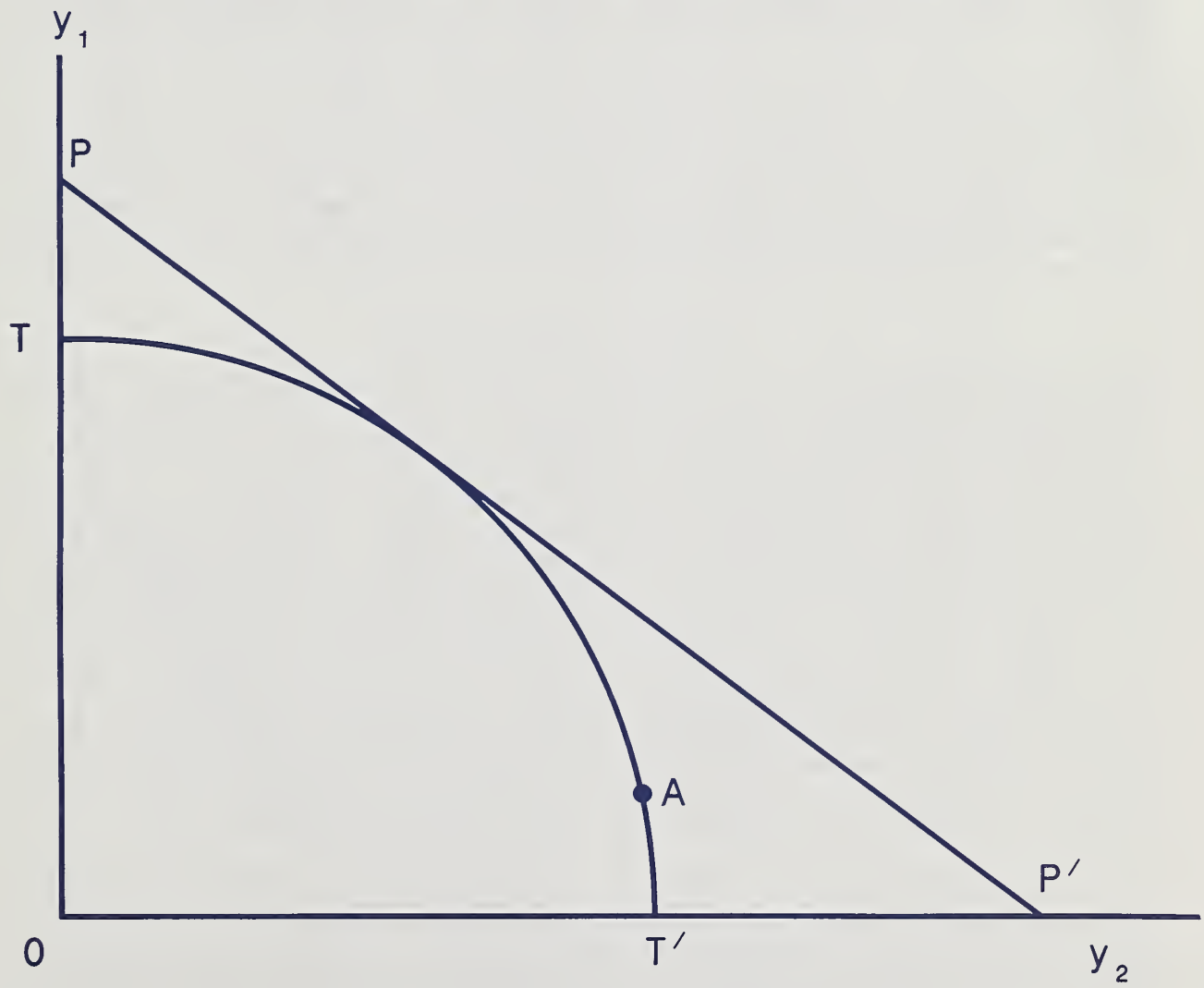
This basic point has been extended in a variety of ways using the compensation principle and other arguments to demonstrate that free trade is always potentially superior to autarky (123). Usually, these arguments involve the possibility of lump-sum transfers between gainers and losers to establish the potential Pareto superiority of free trade. Recently, however, Dixit and Norman established that a domestic tax and subsidy structure always distributes

income in such a manner as to allow all consumers to consume as they would under autarky while still generating a positive amount of tax revenue (65). The existence of the tax revenue suggests that the government could potentially reduce some consumer's taxes, which would lead to an increase in consumer welfare. Hence, all consumers could be kept at least at their original consumption level while making some other consumers better off.

ALTERNATIVE TRADE GAINS RESULTS

Recent literature indicates that traditional arguments are easily violated under such circumstances as increasing returns to scale economies, dynamic economic conditions, foreign ownership of production factors, monopolies, uncertain economic conditions, and government intervention in domestic markets.

Figure 3
Gains from trade in general equilibrium



Increasing Returns to Scale Economies

Economies of scale effects offer interesting modification to the traditional argument for trade gains. Traditional theoretical models typically posit the existence of constant returns to scale while relying upon differential technologies, factor endowments, or tastes to provide a logical basis for international trade. However, Krugman demonstrated that two economies with the same technology and relative endowments will still trade and gain if they have increasing scale economies and Chamberlinian monopolistic competition (118). Opening economies with high degrees of product differentiation to trade is equal to expanding each economy, thereby allowing the monopolistic competitors to expand their operations. But with increasing returns to scale, an expansion of firm size leads to decreases in per unit costs and, hence, trade gains. Moreover, such a model provides a workable explanation of interindustry trade, that is, countries exchanging very similar products, such as Toyotas and Fords.

Other authors have attempted to relax the constant returns to scale assumption in the trade gains analysis. Eaton and Panagariya outlined some conditions under which the movement from autarky to free trade will be beneficial (68). However, an economy with increasing returns will not always gain by trading. Production externalities in the form of increasing returns to scale are essentially distortions, and standard trade theory results indicate that trade subject to distortions may be inferior to autarky. Figure 4 illustrates this point, where the severity of the increasing returns results in a production possibilities frontier that is convex to the origin. Autarkic equilibrium is at point A while international prices are such that the country specializes in the production of y_1 but trades to point B which is inferior to A. However, Markusen and Melvin demonstrated that in a two-country world, only one country can lose as a result of increasing returns to scale (131).

Dynamic Economic Settings

Recent developments in the neo-Ricardian literature on international trade and development have begun to question whether free trade is truly better than autarky for an economy operating in a dynamic setting (71). A country's consumption in a steady state may be higher under autarky than free trade. Mainwaring (128) and Metcalfe and Steedman (137) used this result to argue that trade can cause welfare losses for dynamic economies. However, Smith stated that making welfare comparisons only on steady-state outcomes is misleading (174). What really matters are the dynamic paths the economy follows under free trade or autarky. And here, in the absence of distortions, what is feasible under autarky for a growing economy will usually be feasible under free trade. But the converse does not hold; that is, what is feasible under free trade for a growing economy will not necessarily be feasible under autarky. This follows from the fact that, at each point in time, free trade only requires the intertemporal budget constraint to hold while autarky requires consumption to equal production. Hence, under usual assumptions, free trade will not be Pareto inferior to autarky even in a dynamic setting.

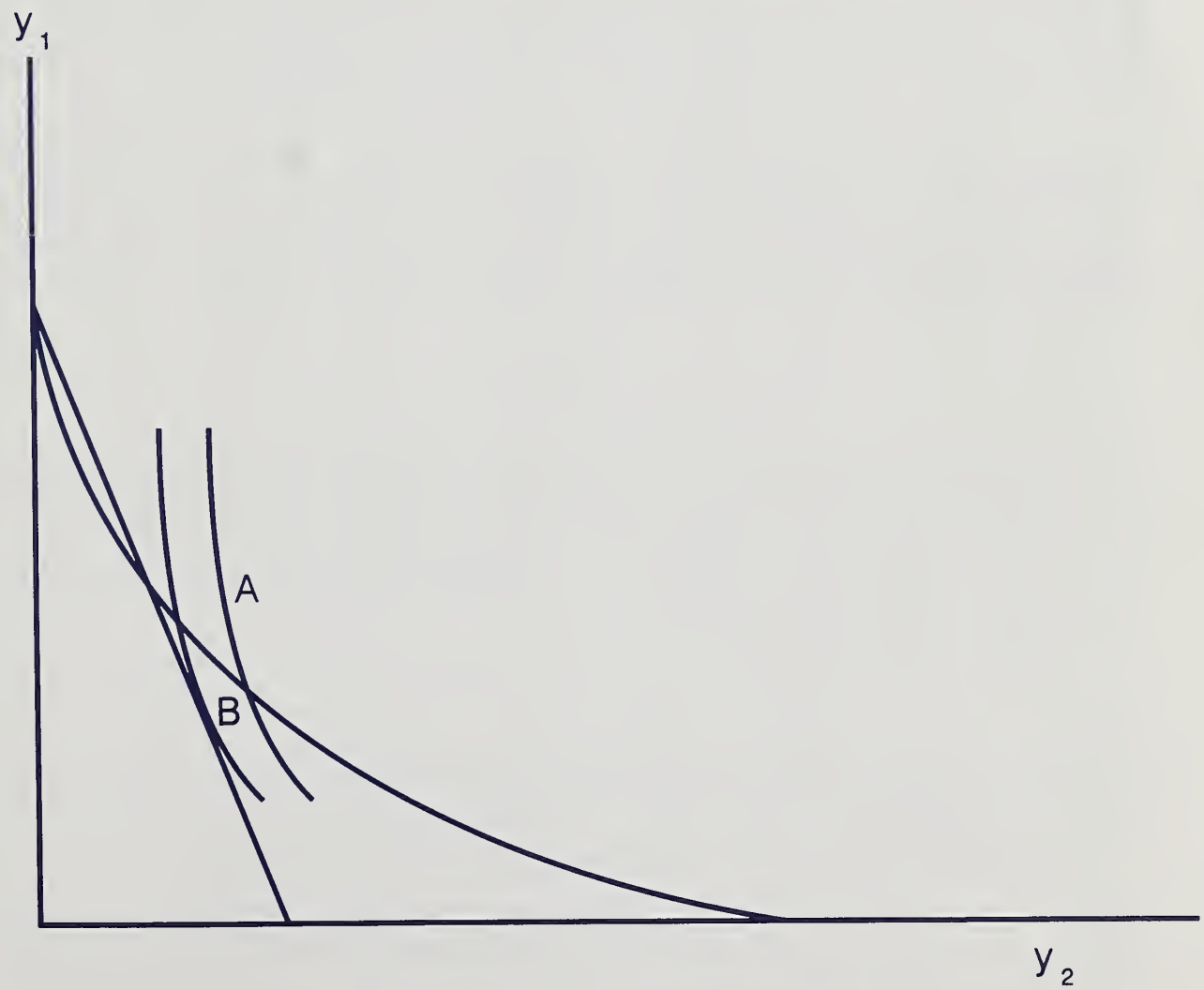
We can view this argument another way: The only analytic difference between a competitive, intertemporal equilibrium and a static equilibrium is that the time dimension, as well as the more usual factors, differentiates commodities in the intertemporal equilibrium. Unless the dimensionality of the commodity vector is an important aspect of the static proof of trade gains, standard arguments should establish the superiority of trade over autarky. If the same commodity available at two different dates is defined as two different

commodities, then standard arguments do prevail as Smith demonstrated (174). The paradox of the steady-state, autarkic consumption level exceeding the steady-state, trading consumption level is still consistent with the preference for trade over autarky because individual gains in a particular generation will outweigh individual losses in other generations, such as those who live in the steady state. This notion is much like the one introduced earlier: With the opening of trade, some people gain while some lose. In a dynamic context, whole generations gain while other generations lose, but on balance, the gains exceed the losses.

Foreign Ownership of Production Factors

Another interesting set of developments in the trade gains literature relates to how the foreign ownership of production factors affects the usual gains from trade arguments. These developments seem particularly relevant to U.S. agriculture because of increased concern over the degree of foreign land

Figure 4
Gains from trade and increasing returns



ownership in the United States and the significant portion of foreign workers in agricultural industries like the fresh fruit and vegetable sectors.

Opening the economy to trade need not always improve welfare, if foreign interests own the production factors. Consider an economy where two production factors in fixed supply produce two outputs according to the usual HOS assumptions. Also suppose that the entire fixed supply of one of the factors is foreign owned, while the other factor is domestically owned. Finally, suppose that in moving from autarky to free trade, the international demand and supply conditions are such that the relative price of the commodity using the foreign-owned factor intensively rises. Then foreign income rises at the expense of domestic income according to the Stolper-Samuelson theorem. Hence, free trade has made this country worse off if only the welfare of the domestic factor owners is taken into account.

Bhagwati and Brecher addressed such issues in a rigorous two-commodity, two-factor, two-country, neoclassical framework (26). Their results confirmed the polar case listed above as a special case. They found, however, that the root cause of the potentially paradoxical results lies in the fact that the aggregate endowment of the production factors, including those owned by foreigners, masks the true factor endowment of the country. This in turn leads to a pattern of commodity trade that the country otherwise could not follow. Bhagwati and Brecher coined this phenomenon the differential trade pattern and have used it to study the welfare implication of exogenously induced terms of trade changes, international transfers, and economic expansion (26).

Bhagwati and Brecher's research is closely related to Mundell's argument that imposing prohibitive trade barriers while allowing the free flow of factors across international borders will result in the usual free trade solution (140). That is, trade in production factors can be a perfect substitute for trade in commodities. Once movement of factors across borders is possible, the standard theorems of the HOS model will be significantly altered.

Monopolies

Movement from autarky to free trade always invokes a welfare gain in trade gains literature if a domestic industry is monopolized but the country is small relative to the world market. The trade gains here consist of two components: the usual gains from engaging in trade as analyzed above and the gain from the destruction of the distorting monopoly that entry into the world market causes. For, although a monopoly may be quite large relative to the domestic industry, it will be small relative to the world market, and the world terms of trade will supersede the monopoly's prices.

This argument does not necessarily apply, however, in the case of large countries. Melvin and Warne suggested that, in some cases, a large country would be better off under autarky than under a trade monopoly situation (135). Moreover, they also demonstrated that the elimination of all monopolies in international trade may maximize world welfare but does not necessarily involve a Pareto improvement. For example, in a two-country world, one of the countries may actually lose by the destruction of its monopoly.

Feenstra recently addressed the closely related issue of monopoly/monopsony in a small open economy and concluded that the movement toward trade liberalization does not necessarily lead to a welfare improvement (77). The model used is an extension of the standard monopoly model described above because it

assumes monopsony on factor markets. The essential difference is that the movement to the international market only destroys the monopoly distortion that plagues the domestic market. The monopsony distortion still exists as long as factors do not flow across international borders. And accordingly, we return to the generalized distortion model that Haberler originally suggested, where trade from a point off of the production possibility frontier need not enhance welfare (87). Feenstra pointed out, however, that the welfare change associated with the movement to free trade has two components: the welfare effect of eliminating the monopoly distortion and the welfare effect of free trade in an economy with a monopoly distortion (77). As suggested above, the latter is potentially negative.

Auquier and Caves examined the closely related subject of a firm with monopoly power at home and abroad (8). From the home country's viewpoint, the optimal policy is to free the firm to act competitively at home while extracting maximum monopoly profits abroad. Suppose, however, that the degree of monopoly cannot be freely varied at home and abroad. Auquier and Caves derived optimal policy instruments under these circumstances.

Uncertain Economic Conditions

Numerous studies have appeared on the gains from trade under uncertain economic conditions. Batra and Russell examined the effects of increasing uncertainty of world prices on the social welfare of a trading nation and demonstrated that free trade may not be optimal (23). Batra then introduced a random variable in the production function and assumed that the expected utility of the producers is to be maximized (19). This analysis was confined to the world of two commodities, two factors, and two countries, and used a special form of the production function, for uncertainty appears as a multiplicative factor grafted onto a classical production function. The conclusions, therefore, depend not only on the producers being risk averse but upon the precise nature of their risk aversion. However, the results still provide insights for the development of trade gains theory. These studies concluded that trade volume and gains are smaller under uncertainty than under certainty, and contrary to the standard HOS conclusion, given constant commodity prices, changes in factor endowments under uncertainty can affect relative factor prices.

Young investigated the case of a small trading country experiencing large fluctuations in terms of trade as a result of uncertain transaction costs and/or erratic movements in spot exchange rates (204). Under otherwise customary assumptions, the following nonautarky theorem was derived: Given trade uncertainty, in general, autarky will not be optimal regardless of variations in terms of trade. Similarly, by introducing forward markets into the analysis, Young showed that, in the long run, autarky cannot be optimal regardless of the variations in terms of trade and whatever the level of forward prices.

Further discussions (18, 67) of the specific issues of uncertainty addressed above generally focus on many of the trade theorems, such as factor price equalization, in addition to the effects of uncertainty on trade gains. The discussions generally support Batra and Russell's (23) conclusions that increased uncertainty in the terms of trade leads to a decline in expected utility. The authors do, however, derive their conclusions under more precise assumptions than had previously been the case.

Turnovsky reworked the Ricardian model of international trade and concluded that expected trade gains for a risk-averse country wishing to trade under certainty may become negative under price uncertainty (188). Just and others formulated a trading model in which both price uncertainty and storage activities are included (112). They showed that, with nonincreasing absolute risk aversion but increasing price uncertainty, both importers and exporters of the stored commodity tend to reduce their trade volume and, in the case of extreme risk aversion and price uncertainty, would be better off not trading.

The previous models allow for commodities trade but not for securities trade. Helpman and Razin demonstrated that once trade is allowed in both goods and securities, thus integrating the trade theory with financial market theory, the trade theory results are quite different than if only goods are traded internationally (93). Securities trade allows for international risk-sharing arrangements. Many of the models reviewed above are special cases of the Helpman-Razin framework when securities trade is not allowed. The models show that the basic trade theorems do not carry over to uncertain environments in the absence of international risk-sharing arrangements. However, the theorems do carry to uncertain environments if international trade in securities is admitted. The basic theorems under certainty do not carry over to uncertain environments because, with uncertainty, it can be assumed that there is no international trade in real equities. This restriction ties each country's production decision to its consumption decision, whereas in standard trade theory, given commodity prices, a country's production decision is unimportant to its consumption decision.

The emphasis on international risk-sharing activities has also been carried over to the literature on international commodity price stabilization. For example, Newbery and Stiglitz contended that the need for buffer stocks to bring about price stabilization is greatly reduced when trade in international securities is incorporated into modeling along with trade in real goods (145). However, Eaton raised an important point on the issue of securities trade about the appropriateness of assuming international trade in equities (67):

> The threat of default or nationalization may limit such trade significantly. That no supranational agency exercises policy power to enforce contracts between agents of different nationalities makes implementation or risk-sharing arrangements at the international level difficult. The experience of the Overseas Investment Services, Ltd. may in fact illustrate some of the difficulties.

Newbery and Stiglitz presented further conditions under which free trade may be Pareto inferior to autarky under uncertainty (145). They considered the case of two countries, each of which produces a safe crop as well as a risky crop. They further assumed that, under autarky, each country has unit elastic demand for the risky crop while production disturbances across the two countries in the risky crop are inversely related. The assumption of unit demand elasticity provides producers of the risky crop with perfect crop insurance under autarky, yielding them a stable income. The introduction of trade between the two countries effectively destroys this implicit crop insurance in each country, thereby making producers of the risky crop worse off while encouraging production of the safe crop. The resulting trading equilibrium is consequently Pareto inferior to autarky. Here the root cause of loss from engaging in trade seems to be the destruction of the implicit crop insurance. If there exist perfect insurance markets (implicit or explicit), uncertainty causes no more problems for trade gains analysis than the standard trade model, but if

insurance markets do not exist so that risks cannot be subjected to arbitrage, divergences from standard results in the trade gains literature can be expected.

The effects of trade instruments, such as tariffs and quotas, in trade theory under certainty are well understood: Provided the government auctions off the quota, the optimum-tariff and the optimum-quota are equivalent. Helpman and Razin showed that a tariff need not protect the import-competing sector under uncertainty without international securities trade (94). However, with securities trade a tariff always protects the import-competing sector. Helpman and Razin further demonstrated a more efficient way for protection under uncertainty (95). With no securities trade, an equity subsidy is preferred to both an ad valorem tariff with a predetermined rate and to a quota with a predetermined size. With securities trade, an equity subsidy dominates an ad valorem tariff whenever investors do not choose to specialize in asset holdings of the domestic export sector or their perfect foreign substitutes. Young concluded that the policy that maximizes expected domestic surplus is a fixed tariff schedule depending only on world price if the demand and supply function uncertainty is multiplicative (204). If uncertainty is additive in the demand and supply schedules, then the ranking of ad valorem tariffs and quotas depends on many factors, but a specific tariff is always superior to both these policies.

Young and Anderson demonstrated that the optimal policy subject to a ceiling on expected imports is a specific tariff and the optimal policy subject to a ceiling on expected foreign exchange expenditure is an ad valorem tariff (205, 206). Thus, different constraints require different forms of tariff. They also showed that the optimal policy for achieving a ceiling on expected imports involves an import reduction if the world price of the importable good is uncertain and risk aversion is high. A tariff is superior to a quota under domestic uncertainty, but reducing the domestic price could be optimal. Jabara and Thompson demonstrated that an optimal tariff for a small economy exists under uncertainty contrary to the usual result that a small, open economy always loses by interfering in trade channels (101).

Government Intervention

Another topic is the impact of trade tariffs, quotas, and other barriers on trade gains. Although U.S. agriculture is often perceived as being quite open to the international economy, some markets, such as sugar, dairy, and beef, are insulated from the international market for domestic policy purposes. Sugar is perhaps the most obvious example because it is often argued that the domestic beet processing industry would be completely destroyed if the restrictive sugar cane import policy were significantly relaxed. Similarly, since the midsixties, the domestic beef market has been protected from foreign competition by an import quota as well as a series of voluntary restraint agreements negotiated with U.S. trading partners. However, Allen, Dodge, and Schmitz argued that the voluntary restraint agreement actually works in favor of the exporting nations and not the United States (3). Furthermore, Chambers and others have presented empirical evidence suggesting that the quota arrangement may have involved significant U.S. welfare losses (50). Such findings highlight the need for a clear understanding of the welfare implications of restrictive trade policies.

A small country will always lose in standard trade models by the imposition of any free trade restriction because a small country cannot affect prices in the international market; it can only affect domestic prices. Thus, regardless of

its import or export policy, a small country, at best, can only fetch the international price for an export commodity, while it must always pay the international price for an import commodity. Therefore, any restrictive import pricing policy can only be effective by driving a wedge between the domestic commodity value and the international value. This leads the economy to a different production point than the economy would realize under international trade. But because the economy is forced to trade at international prices, the international income that this new production pattern generates can never exceed, and is usually less than, the income that the free trade production point generates. The point here is similar to that illustrated in figure 2 where the autarkic production point always lies within the effective income set generated by the free trade production pattern. Similar arguments establish that a quota arrangement generally involves a welfare loss for a small economy in the world market. A quota restricts the range of trading arrangements that a country can make. Hence, any trading arrangement that can be arrived at with a quota could always be attained in the less restrictive free trade case. Therefore, the potential gain must be as large for the less restrictive free trade case as the quota-ridden trade case.

Circumstances change, however, when a country can affect the international trade terms. A country can gain by restricting trade via an optimal quota. Much of the literature on this issue revolves around the design and relative efficiency of such policies. The important point is that the country in question can use its power in the international market to affect favorably the terms of trade that it receives much like a domestic monopoly or monopsony adjusts production or purchases to maximize its income. Either a partial- or general-equilibrium framework demonstrates optimal tariff structure. In figure 5, let ED be the excess demand curve of an importing country while ES is the excess supply curve of the exporting country. A country imposing an optimal tariff would want to control the amount it imports to maximize its trade surplus and tariff revenues. The solution to this problem is to take the marginal curve to ES, equate this margin curve, MES, to ED to obtain the import quantity, and derive the optimal tariff accordingly. In figure 5, the optimal level of imports is OQ_T, while the domestic price level is OP_D and the international price level is OP_T, implying that the optimal tariff is P_DP_T. The analogous general-equilibrium argument is to have the country with the market power move to the point on the foreign country's offer curve where its highest trade indifference curve is just tangent.

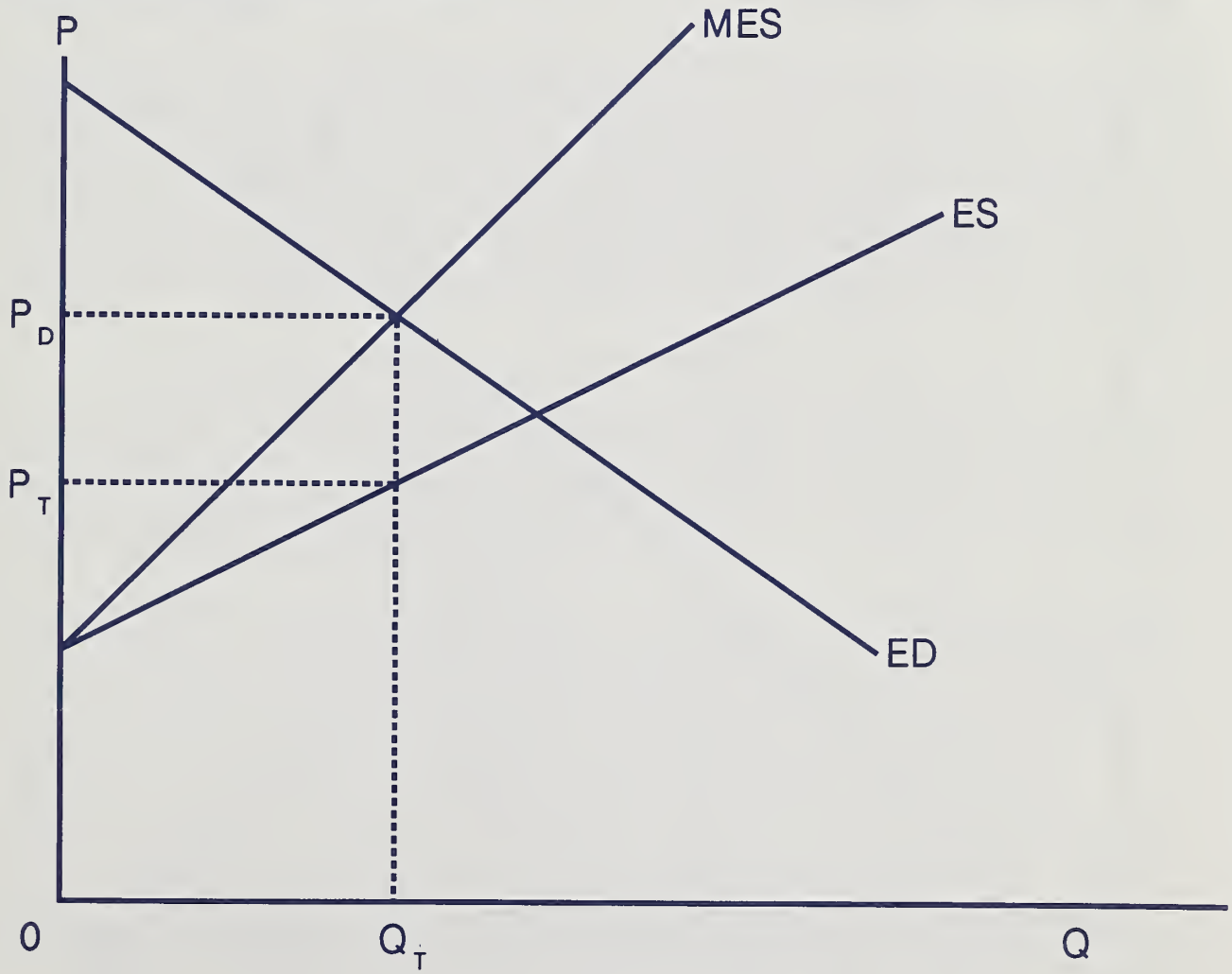
Arguments like these presume that either the foreign country does not have any market power or that it does not exploit it. If these assumptions are invalid, the situation becomes closely akin to that of bilateral monopoly where standard theory offers no clear resolution. Several studies have attempted to assess appropriate policy actions when the imposition of tariffs is likely to lead to similar retaliation by other countries. Tower, Sheer, and Baas examined various policy scenarios and concluded that world welfare always declines as a result of any nonzero tariff structure (186). Under retaliation, both countries may end up losing if one country imposes its optimal tariff. Tower, Sheer, and Baas also outlined sufficient conditions for a country to gain from imposing its optimal tariff. Thursby and Jensen used a game theory approach based on a conjectural variations framework to consider the design and formulation of trade policy recognizing the possibility of retaliation (184). Such problems also seem to offer fairly obvious areas of applications for recent developments in differential game theory where each country's optimal strategy is predicated on the solution of an optimal control problem.

Riezman used a game theory approach to address the problem of retaliation (160). Because countries face the classic prisoner's dilemma (where each country finds it best to restrict trade irrespective of the activities of other countries), even though free trade is the best world strategy, there is no reason to expect that free trade will be chosen. However, if a country's trading partner institutes a tariff, the best strategy also is to impose a tariff. Otherwise, the country could be subject to the optimal tariff and would lose accordingly. Even if countries cooperate, however, free trade may not be chosen if the gains from trade are not equally distributed.

A particularly interesting area of research that has recently emerged is the application of the design of optimal income taxation and public utility pricing on international trade theory. Saidi and Srinagesh, the main contributors to this literature, consider the case of a small, open economy that is trying to raise revenue by taxing imports (165). They find that the optimal tariff structure would be a two-part tariff consisting of a lump-sum entry fee to

Figure 5

The optimal tariff in a partial equilibrium model

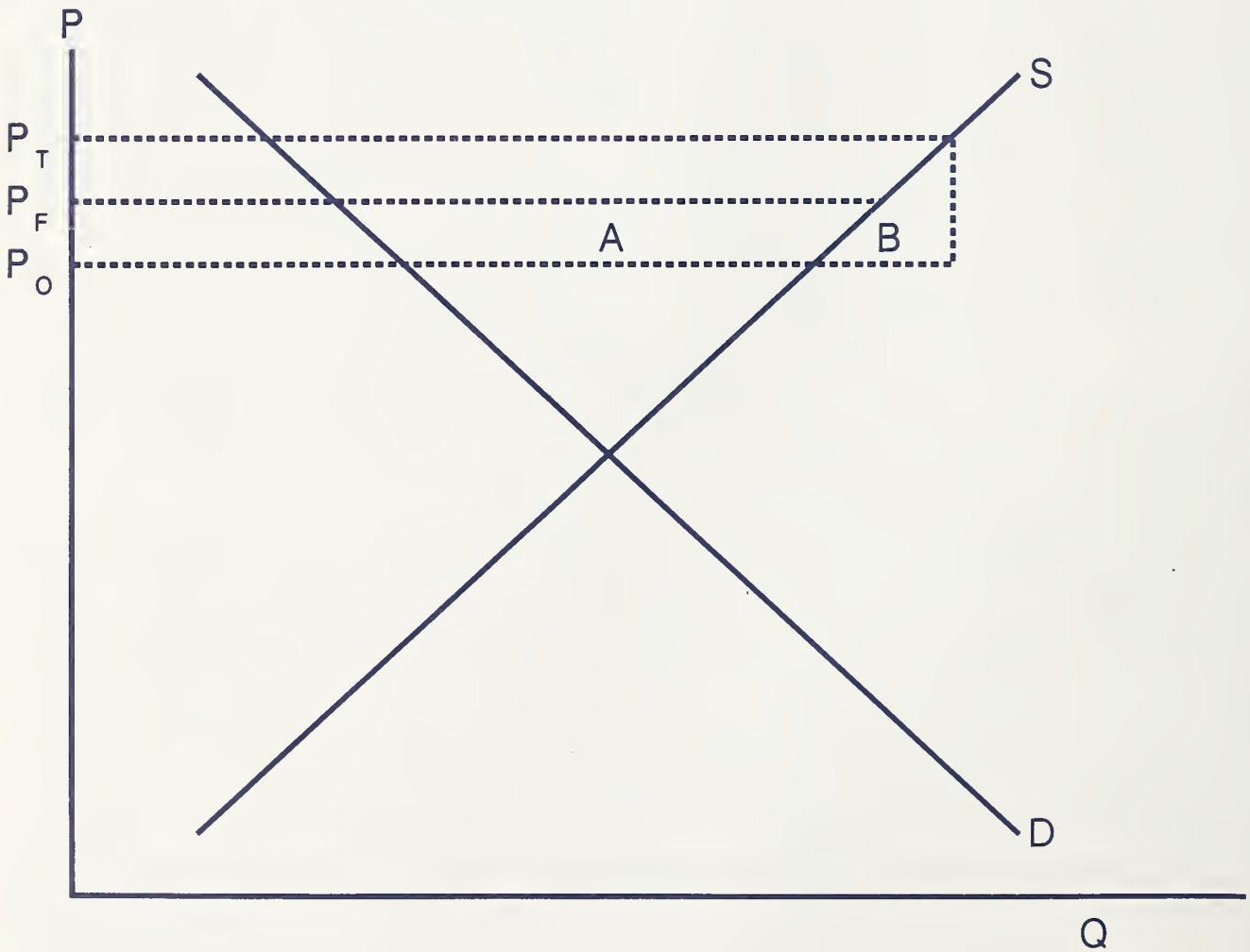


enter the import market as well as a marginal tariff schedule. The lump-sum fee keeps certain consumers out of the import markets.

A closely related, but often neglected, problem is the effect of domestic policy alternatives in large, open economies on international markets and trade gains. Schuh has long argued that the maintenance of an overvalued exchange rate by developing nations is equivalent to the imposition of implicit import tariffs and export taxes (171). For example, U.S. agricultural loan rate programs, deficiency payment programs, and acreage allocation programs can act as implicit export taxes, export subsidies, and export quotas, respectively. To clarify this point, we summarize the arguments of Chambers and Schmitz who consider the effect of deficiency payment programs on the trade gains (49).

Figure 6 depicts the domestic supply and demand situation of a large, open economy in a market with effective target prices. Without the deficiency payment program, the international equilibrium is at price P_F. But, the imposition of the deficiency payment program with target price set at P_T

Figure 6
Deficiency payments and losses in trade gains



decreases the world price to P_0. The deadweight loss associated with the program equals areas A + B, of which area A is the trade surplus loss that the program causes. Thus, trade gains fall as a result of the program. In fact, in some cases, such a program can effectively eliminate any trade gains.

Rent Seeking

Government restrictions on economic activity give rise to rents. Krueger developed a competitive rent-seeking model where rents originate from quantitative restrictions, such as import licenses and minimum-wage legislation, upon international trade (117). Krueger concluded the following: (1) competitive rent seeking leads to the economy operating inside its transformation curve; (2) the welfare loss is greater than the loss from the tariff equivalent of these quantitative restrictions; and (3) competitive rent seeking results in diverging private and social costs of certain activities.

A vast literature on the topic of rent seeking has developed. Brock and Magee considered the economics of special-interest politics, showing how certain groups are successful at lobbying for tariff protection (38). Bhagwati and Hansen analyzed smuggling in international trade (27). Rausser in a recent paper considered both Krueger-type rent-seeking activities that reduce productivity and government instruments that remove externalities and increase productivity (156).

Bredahl and others considered rent seeking by U.S. and Mexican winter vegetable producers (37). The study showed which type of trade policy leads to competitive rent-seeking activities by producers on both sides of the border and which is cooperative in nature. Tariffs yield competitive outcomes, while voluntary quotas can yield a cooperative outcome where producers' rents are jointly maximized. The study tested this model empirically and showed that, at times, the Mexican and Florida winter vegetable producers operated an import-export cartel where producers' rents in both countries were jointly maximized.

GOVERNMENT INTERVENTION AND U.S. AGRICULTURAL TRADE GAINS

Dardis and Learn (58) discussed and applied procedures for partial-equilibrium measurement of costs of protection. These procedures are closely related to the work of Corden (54) on partial-equilibrium costs of protection and our earlier discussion of figure 1. The applied part of the Dardis and Learn study appears to have many errors (see (104), p. 311).

Figure 7 summarizes the partial-equilibrium measure of the welfare cost of an import tariff. W denotes the exogenous world supply price of imports; dp, the absolute tariff; S and D, the domestic supply and demand schedules for the imported commodity; and dS = B - A and dD = E - C, the decrease in domestic production and the increase in domestic consumption of the commodity if the tariff is abolished. The total area of the two triangles ABF and CEG represents the welfare cost of the tariff on the imported good, or the partial-equilibrium measure of the welfare benefits of abolishing the tariff. The tariff leads to a reduction of W^1WEG in consumer surplus, an increase of W^1WAF in producer surplus, and an increase of BCGF in tariff revenue. This partial-equilibrium analysis is acceptable to the extent that the change in imports of the commodity does not affect other commodities, and that changes in the balance of payments are minor. Similar comments apply to the welfare costs of a subsidy on an export good (fig. 8). The small country case is analyzed,

so the welfare cost of the tariff as Dardis and Learn observed equals the trade surplus loss associated with the tariff policy (58).

For the multicommodity case, the changes in total producer cost (ΔPC) and consumer cost (ΔCC) for a change in import tariffs are defined:

$$\Delta PC = 1/2 \sum_i \sum_j (\delta S_i/\delta P_j)dP_j$$

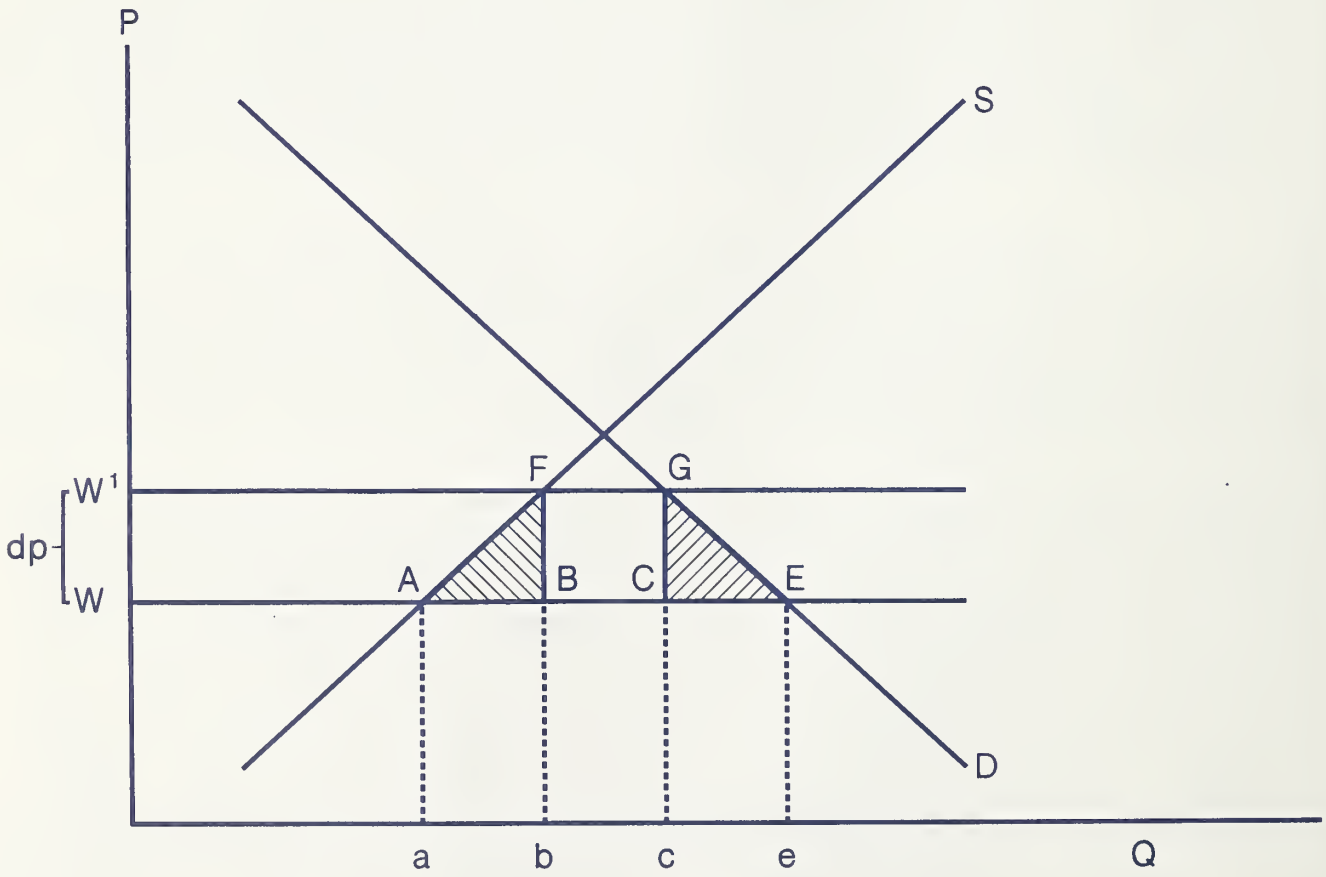
$$\Delta CC = 1/2 \sum_i \sum_j (-\delta D_i/\delta P_j)dP_j,$$

where $S_i = S_i(p)$ denotes the product supply schedule for commodity i, p is the commodity price vector, and $D_i = D_i(p, u)$ is the Hicksian (compensated) consumer demand schedule for commodity i (u denotes the consumer's utility level). Dardis and Learn noted that the sums of own price effects $(\delta S_i/\delta P_i)dp_i$ and $(-\delta D_i/\delta P_i)dp_i$ are less than ΔPC and ΔCC when all goods are substitutes (58). In addition, summing $(\Sigma S_i/\Sigma P_j)dp_j$ over both inputs and outputs will overestimate ΔPC due to the interdependence between inputs and outputs.

Coyle (55) recently demonstrated that the Dardis and Learn (58) approach has even more formidable technical problems. Dardis and Learn assumed in their applied analysis that the demand and supply elasticity for wheat in the United States, United Kingdom, West Germany, France, Italy, Denmark, The Netherlands, and Canada is approximatly 0.5. Cross-price effects are ignored. Using the

Figure 7

Cost of protection for import tariff



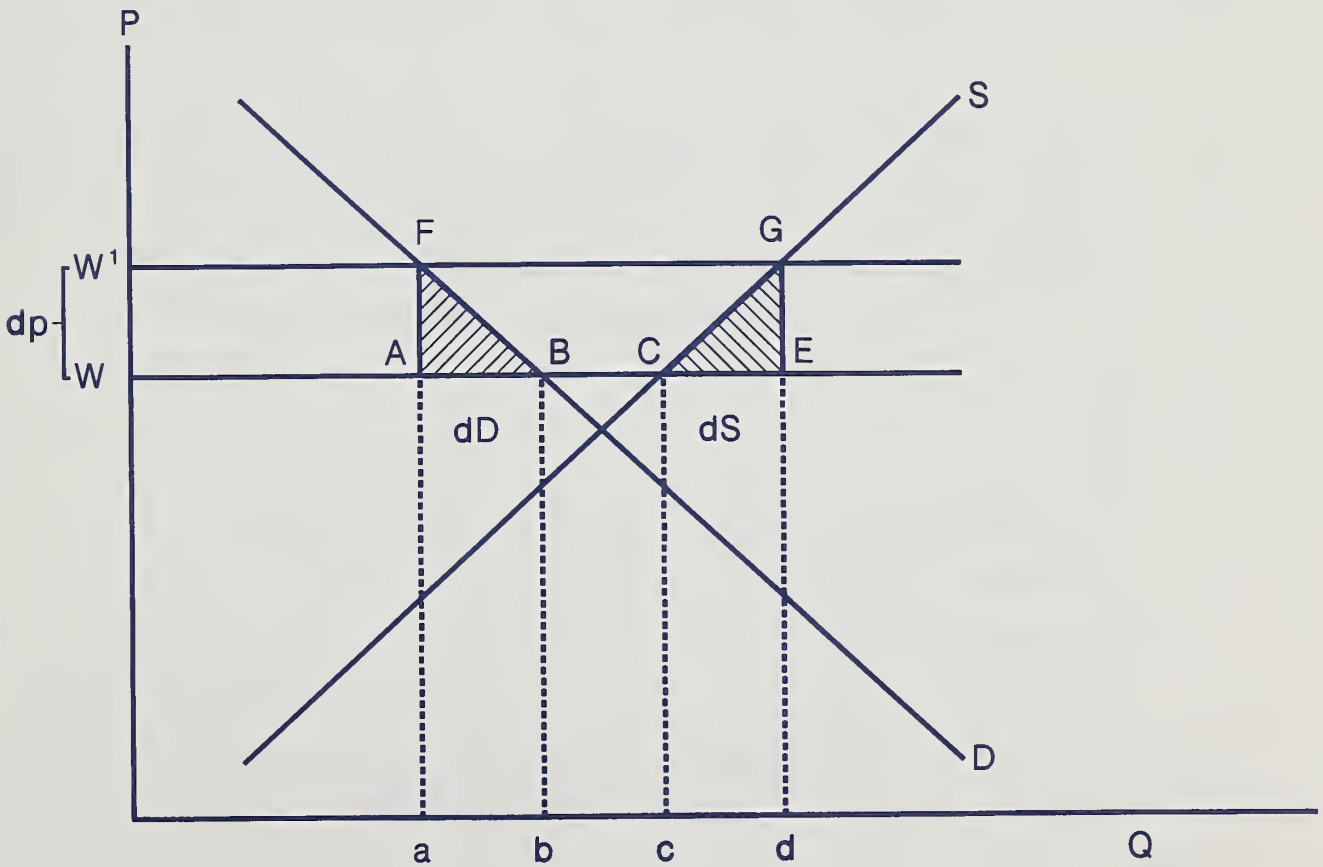
partial-equilibrium methodology outlined above, the authors calculated the protection cost for wheat (table 1) (circa 1980). The authors reported results for the United States using the average tariff over all wheat varieties and the average tariff for hard winter wheat, assuming that the quality of exported wheat is higher than that for all wheat. They speculated that the results for the high-quality hard winter wheat are more representative of protection costs. These protection costs relative to the value (at export prices) of domestic production and consumption were 0.2 percent and 0.8 percent for all wheat and hard winter wheat, respectively.

Magee provided a more thorough analysis of how trade restrictions have affected U.S. trade gains since 1971 (127). The partial-equilibrium analysis is similar to that of Dardis and Learn (58). Losses in trade gains are modeled as in figures 7 and 8. The imports considered include intermediate goods as well as consumer goods, although at the time of the study, traditional theory had dealt only with consumer goods. However, the analysis has been shown to generalize exactly to intermediate goods (4, 11).

Magee analyzed the trade restriction costs for three U.S. import categories: those that compete directly with U.S. production and are subject to tariffs; those that compete only partially; and those subject to quotas or intergovernmental agreements (127). Available data concerning imports that compete directly with U.S. production and are subject to tariffs were limited

Figure 8

Cost of protection for export tariff



to manufactured imports. For these commodities, the shortrun and longrun elasticities of domestic demand and supply were specified to be consistent with econometric estimates of export demand elasticity (assumed to be -3 in the short run and -8 in the long run). For imports that neither compete directly with domestic production nor are subject to quotas, deadweight losses attributed to the tariffs were calculated directly from assumed lower import demand elasticities (-2 in the short run and -5 in the long run). Approximately one-sixth of U.S. imports under quotas were in agriculture (sugar, meat, dairy). In contrast to Dardis and Learn, Magee (127) did not assume that foreign exporters captured the tariff-equivalent quota revenues. The annual average loss of the sugar quota was estimated at $400 million (including $290 million tariff-equivalent revenue paid to foreigners), accounting for one-ninth of the welfare loss for all quotas. Less than 2 percent of these total losses were attributed to quotas for meat and dairy products. Thus, the sugar cane quota program proved to be a dominant source of welfare losses in international agricultural trade.

Magee also presented crude estimates of welfare losses due to restrictions on U.S. exports (127). He assumed that elimination of domestic programs designed to keep farm resources idle (in order to maintain farm incomes) and removal of restrictions on U.S. exports would cause a 77-percent increase in agricultural exports at essentially zero cost. Thus, he calculated substantial welfare gains due to removal of barriers to U.S. agricultural exports: $3 billion per year in the short run and $5 billion per year in the long run. However, because additional resources would be needed to produce these export increases, these figures presumably overstated the welfare gains of removing the barriers. Magee estimated that the combined effect of import and export restrictions annually averaged $7.5 billion in the short run and $10.5 billion in the long run, so approximately half of the total welfare losses in both the

Table 1--Estimated protection costs for wheat, 1980

Country	Protection cost	
	Percent 1/	Million dollars
Canada	-25	0
France	15	9.2
United Kingdom	16	1.4
West Germany	40	44.5
United States:		
All wheat	3	5.0
Hard winter	16	12.6

1/ Percent tariff = 100 . $\frac{\text{producer price - import or export price}}{\text{producer price}}$.

Source: (58).

short run and long run were due to restrictions on U.S. agricultural exports (127). Because Magee's results were for a period prior to the tremendous export boom of the midseventies, they may be used as a crude gauge of the trade gains resulting from that boom. Agricultural export value increased fivefold during the seventies, and although agricultural costs undoubtedly rose, Magee's estimates would serve as an absolute lower bound for these gains. The tremendous change in policy climates between the time of Magee's study and now is interesting to note. The United States is mainly interested in the design of agricultural programs that will enhance its competitive edge. Table 2 summarizes Magee's static gains estimates.

Cline and others estimated the trade, welfare, and employment effects of various trade liberalization schemes for 10 industrial countries and the European Community (EC) (circa 1973) (53). The critical components of the models are the import price elasticities, which are taken from other studies. For U.S. agriculture, estimates by Kreinen (116) were used, where imports of a commodity group were estimated as a log-linear function of own price and gross national product (GNP) using ordinary least squares. Table 3 summarizes price elasticities estimates of U.S. agricultural imports. However, omitting the cross-price effects on import demand seriously distorted estimating equations,

Table 2--Static U.S. trade gains estimates due to trade liberalization

Type of restriction eliminated	Static trade gains estimates	
	Shortrun	Longrun
	Million dollars per year	
Tariffs and U.S. imports with close domestic substitutes	97	291
Tariffs on other U.S. imports	81	202
Quotas on U.S. imports	--	3,555
Restrictions on U.S. manufactured exports	246	380
Restrictions on U.S. agricultural exports	3,000	5,000
Total effect of eliminating import and export restrictions	7,500	10,500

-- = Not applicable.

Source: (127).

Table 3--Weighted average import price elasticities by product

Product	Elasticity
Animals and products	-0.53
Vegetable products	-.90
Fats and oils	-.43
Food, beverages, and tobacco	-1.13

Source: (50).

and simple ordinary least squares may have been inappropriate due to simultaneous equations bias.

Cline and others then used these estimated import demand equations to calculate the effects of various tariff liberalization schemes and reductions in agricultural nontariff barriers on imports (53). The welfare benefits of tariff liberalization are calculated as:

$$\sum_i 1/2\ (P-P^1)^i(M^1-M)^i + (p^1-p^w)^i(M^1-M)^i = \Delta W^i,$$

where $(p - p^1)$ equals the domestic price decrease in commodity i imports after the tariff reduction; $(p^1 - p^w)^i$, the difference between the domestic import price at the reduced tariff and the world supply import price; and $(M^1 - M)^i$ the increase in import quantity. Trade liberalization is assumed not to affect p^w. The above formula is derived from a partial-equilibrium analysis of the effects of a tariff in a country's market for a commodity that is both produced domestically and imported. However, such partial-equilibrium analyses do not generally provide accurate indicators of general-equilibrium effects. In addition, the import elasticities used cannot reasonably be interpreted as partial-equilibrium responses; at best, these elasticities represent reduced-form (quasi-general equilibrium) changes in import demand as cross prices endogenous to the economy adjust to changes in import prices. Thus, the analysis cannot be interpreted as either a partial or general equilibrium.

Table 4 summarizes the estimated annual static welfare gain to the United States (circa 1974) from 60-percent and 100-percent tariff reductions for all regions under study. The total static welfare gains of $1,179 million approximate 10 percent of the value of total U.S. imports (circa 1974). The dynamic welfare effects of trade liberalization (increased scale economies, increased investment rate, increased efficiency, and reduced inflation) may substantially exceed the static trade gains. Using studies within the European Common Market as a benchmark, Cline suggests that the dynamic welfare effects are on average (over all countries) approximately five times as large as the static trade gains, and that, for the United States, the dynamic effects are a smaller multiple of the static effects. Incorporating scale economies or investment changes directly into the estimation procedure is not attempted.

Brown and Whalley constructed a numerical general-equilibrium model of international trade with endogeneous prices (39). Thus, terms of trade effects

Table 4--U.S. trade gains from tariff reductions in industrialized countries

Item	Trade gains	
	60-percent reduction	100-percent reduction
	Million dollars	
U.S. total:		
Excluding textiles and petroleum	490.3	583.7
Excluding petroleum	990.5	1,179.1

Source: (53).

could be incorporated directly into the anaysis of effects of trade liberalization.

Brown and Whalley employed an HOS-type trade model incorporating four trading areas: the United States, Japan, EC, and the rest of the world (39). The authors designated five aggregate commodities for each area: agriculture and food, raw materials and extractive products, nondurable manufactured goods, durable manufactured goods, and services. Each industry and area has a constant elasticity of substitution (CES), constant returns to scale, and a value-added, production function which permits substitution between capital and labor services; intermediate products of other industries are treated as fixed coefficient inputs in the production of final goods. On the consumption side, a CES utility function is specified for a representative consumer in each trading area and for consumer incomes related to the total value of primary factors located in the trading area (plus government transfers minus taxes). Domestic taxation and subsidy policies enter the model along with tariff barriers, and quotas and other nontariff barriers are represented in the model in ad valorem equivalent form.

The authors considered the model too complex to be estimated directly by econometric methods, so they attempted to construct a data set (circa 1973) consistent with the equilibrium conditions of the model (demand equals supply for all products, zero economic profits for each industry, zero balance of foreign trade for each country). They used this equilibrium data set to help identify parameters of the model. The authors employed the following elasticities of substitution in production for each region: agriculture and food (0.64); raw materials (0.50); nondurable manufactured goods (0.93); durable manufactured goods (0.74); and services (0.97). The following point estimates of uncompensated own-price elasticities of final import demand were calculated: United States (-1.63); EC (-0.91); and Japan (-0.77). Once fully specified, the model was solved for a general equilibrium, and limited sensitivity analyses did not uncover multiple equilibria.

The general-equilibrium model was solved under the existing tariff and nontariff trade barriers (circa 1973) and under five tariff-reduction policies proposed at the Tokyo Round of trade negotiations. These proposals excluded tariff reductions on agricultural products and reductions in nontariff trade barriers. In addition, the authors simulated the effects of a unilateral abolition of U.S. tariffs, and the multilateral abolition of tariffs, nontariff barriers, and tariff and nontariff barriers, as well as several other trade liberalization policies. Table 5 summarizes the longrun, general-equilibrium welfare effects of various trade liberalization policies in terms of aggregate compensating variations (income changes required to compensate each consumer for price changes evaluated at initial levels of welfare.) In this table, a positive number indicates an increase in welfare due to the policy experiment. The United States proposed at the Tokyo Round a 40-percent reduction in tariffs above 6.7 percent on manufactured products and raw materials, and a nonlinear tariff reduction for tariffs less than 6.7 percent.

These results must be interpreted with caution due to the many simplifying assumptions in constructing the model and to data limitations. All policy experiments lead to an increase in the measure of total world welfare, but regional welfare changes vary substantially. The greatest change in magnitude of the U.S. welfare measure is the reduction in welfare accompanying a unilateral abolition of U.S. tariffs. Thus, the terms of trade effects are

substantial for the United States, and national interests have strong arguments for policies to approximate optimal tariffs.

Schmitz and others investigated the potential trade gains increase for exporting producers and nations of various grain export cartel arrangements (170). The authors derived quantitative assessments of cartel effects largely from an Economic Research Service (ERS) model by Rojko, Urban, and Naive (162). The following point elasticities at free-trade equilibrium were calculated: as excess wheat supply (0.54), excess wheat demand (-1.38), excess coarse grains supply (1.98), and excess coarse grain demand (-1.66).

A government cartel is defined as choosing export levels so as to maximize producers' profits from foreign trade, whereas a producer cartel is defined as choosing domestic production and export levels to maximize the total domestic and foreign producers' profits. The distribution of benefits from cartels is calculated, relative to benefits at free trade, for 1980 (table 6). Thus, consumers gain at the expense of producers in the case of a government cartel and conversely in the case of a producer cartel.

An agricultural trade model was used to estimate the effects of U.S. participation in a world wheat and coarse grain cartel for 1979-83. Calculations with this more detailed simulation model suggested that the U.S. could make substantial welfare gains. Under the most favorable alternative considered, 1979 U.S. export revenue could be double from $12 billion to $24 billion.

DeMelo specified a Walrasian trade model which was solved for a set of market-clearing prices and wages (136). Substitution possibilities were modeled in both product and factor markets. A Stone-Geary utility function was maximized subject to a budget constraint, yielding a linear expenditure system

Table 5--Welfare effects (compensation variations) of trade liberalization (1973 dollars)

Policy experiment	United States	EC	Japan	Rest of world	World total
			Billion dollars		
U.S. proposal	0.78	2.27	0.91	-2.48	1.48
Unilateral abolition of U.S. tariffs	-3.19	1.07	.63	2.40	.91
Multilateral abolition of:					
Tariffs	2.77	4.84	1.48	-2.15	6.94
Nontariff barriers	-1.49	3.73	.08	12.64	14.80
Tariff and nontariff barriers	2.32	8.0	.15	9.28	19.45

Source: (39).

of consumer demands. In production, the requirements for intermediate inputs are given by fixed input-output coefficients, and substitution possibilities are restricted to primary factors. An equilibrium is characterized by all excess demands being equal to zero. The model was applied to estimating the protection costs in Colombia (circa 1970). Table 7 summarizes the results.

Boadway and Treddenick constructed a model of the Canadian economy consisting of 56 industries, two primary factors (labor and capital), and interindustry product flow (33). The authors used Cobb-Douglas and CES forms of production functions for primary inputs. Intermediate inputs enter production in fixed proportions or as part of a Cobb-Douglas form. All prices (including the foreign exchange price) were determined on competitive markets, and existing commodity taxes and income taxes as well as tariffs were included in the model. Using 1966 input-output data, the authors selected the system parameters so as to reproduce exactly all observed final demands, outputs, and factor employment levels. Then all tariffs were set equal to zero, and a new general equilibrium was calculated conditional upon the parameter values assigned to the system.

Qualitative general-equilibrium results of eliminating tariff barriers (table 8) were not sensitive to the alternative assumptions employed concerning production, substitutability of imports for domestically produced commodities, and measurement of labor units. But results were sensitive to the choice of export demand elasticities. Removal of tariffs slightly lowers the wage-capital rental ratio; that is, the tariff structure somewhat protects labor-intensive industries relative to capital-intensive ones and, of more direct interest to this study, slightly lowers the measure of consumer utility due to a deterioration in the trade terms.

In contrast to the above studies, Clements econometrically estimated a general-equilibrium model that was extremely aggregated and excluded trade

Table 6--Welfare effects of wheat cartels

Item	Wheat cartel	
	Government	Producer
	Million dollars per year	
Major wheat exporters:		
Gain to--		
Consumers	5,361	-3,634
Producers	-17,049	6,871
Export tax revenue	16,003	674
Total gain	4,315	2,563
Major wheat importers:		
Gain to--		
Consumers	-25,202	-29,016
Producers	17,780	20,651
Total gain	-7,422	-8,365

Source: (170).

terms (52). U.S. commodities were aggregated into three groups: imports, exports, and nontraded goods. The author expressed the joint supply of these commodities in terms of a quadratic transformation function and specified consumer demands in terms of a linear expenditure system. In addition, the model had a domestic market-clearing condition for nontraded goods and an income identity plus absorption equation (a partial-adjustment equation, whereby savings reduce the gap between actual and longrun desired stock of wealth). The commodity supply and consumer demand equations were nonlinear in parameters and were estimated as linear approximations. Estimators were obtained for the linear version of the model using U.S. annual data for 1952-71. The imposition of a higher tariff in 1959 was simulated by

Table 7--Protection costs in Colombia

Item	Percentage change 1/
Coffee quota maintained:	
Fixed capital and land	-0.3
Variable capital and fixed land	1.1
Variable capital and land	1.8
Optimal coffee tax maintained:	
Variable capital and fixed land	3.9

1/ Percentage change in welfare from tariff solution (at 1970 world prices) due to removal of tariffs.

Source: (136).

Table 8--General equilibrium effects of eliminating tariffs from Canada

Output product	$N_i = 1$	$N_i = 10$	$N_i = 25$ 1/
	Percentage change		
Agriculture, forests, fish	1.32	-0.29	-1.86
Food, tobacco, beverages	-.30	.15	-.23
Mining (excluding coal)	2.94	.20	-1.79
Fuels, mines, wells	1.69	-.76	-2.98
Textiles	-.15	1.32	2.46
Chemicals, rubber, petroleum	-.11	.38	.57
Other manufacturing	.11	.18	.24
Wage-rental ratio	-.18	.32	.67
Exchange rate	5.28	-.47	-.48
Welfare index	-1.16	0	.4

1/ N_i = Export demand elasticity.

Source: (33).

increasing the domestic input price 5 percent over 1959-71 (table 9). In the long run, a tariff hurt the exported goods sectors more than it did nontraded goods.

Applebaum and Kohli investigated Canadian-U.S. trade for the appropriateness of the assumption of price-taking behavior in internal markets, that is the small, open-economy hypothesis employed in most empirical studies of international trade (7). Their models tested for the possibility of naive markup monopolistic/monopsonistic behavior as well as classical monopolistic/ monopsonistic behavior. The authors formulated two models. In the first model, a Canadian aggregate output is produced by Canadian capital, labor, and Canadian imports from the United States and Canadian importers may show noncompetitive behavior. A U.S. aggregate output and U.S. exports to Canada are produced from capital and labor under competitive behavior. In the second model, a Canadian aggregate output and exports to the United States are jointly produced by Canadian capital and labor, and Canadian exporters may show noncompetitive behavior. A U.S. aggregate output is produced from domestic capital and labor plus imports from Canada, and U.S. producers show competitive behavior.

The system for each model specifies generalized Leontief transformation functions for both countries and is estimated as a system of Canadian inverse demand/supply equations. The authors do not reject the hypothesis of competitive behavior by Canadian importers of U.S. products but do reject this hypothesis in favor of markup behavior in the case of Canadian exports to the United States. These conclusions are consistent with the estimated low elasticity of U.S. supply of imports from Canada and larger magnitude for elasticity of U.S. demand for Canadian imports. In addition, imposing the assumption of competitive price-taking behavior on Canadian exporters to the United States leads to significant changes in estimated elasticities (table 10). Thus, errors in specifying can apparently lead to significant inaccuracies in estimated trade effects.

FUNCTIONAL FORMS FOR ECONOMETRIC ESTIMATION

The results of empirical studies of trade gains depend upon model specification, estimation methods, and model construction. Therefore, individuals interested in trade gains should have a firm grasp of the issues

Table 9--U.S. aggregate supply and demand changes for a 5-percent increase in the domestic import price, 1959-71 (1959 base year)

Year	Supply			Demand				
	Exports	Imports	Nontraded goods	Exports	Imports	Nontraded goods	Real exports	Real imports
	Percentage change							
1959	-3.11	2.45	-2.83	-1.08	-2.96	-2.87	-13.21	-37.10
1965	-3.31	1.65	-2.29	- .59	-2.31	-1.60	-19.78	-57.54
1971	-3.66	1.52	-2.06	- .42	-2.33	-1.22	-16.33	-36.55

involved in empirical trade modeling. This section presents a brief review of some recent developments in trade model specification that are potentially estimatable.

Woodland introduced the concept of an indirect trade utility function that is conditional upon the existence of a direct community utility function (199). Suppose an economy has an endowment vector v of fixed production factors and that all agents exhibit competitive behavior at prices p for net outputs y. This yields the GNP function: which is defined as:

$$g(p,v) = \max py: yY(v) \quad p \geq 0, \; v \geq 0,$$

where Y(v) denotes the set of feasible net outputs y conditional on v.

Assuming a utility function u(x) and a budget constraint $px \leq m$, for income m, the indirect utility function is defined:

$$V(p,m) = \max u(x): px \leq m, \; x \geq 0 \quad p \geq 0, \; m \geq 0.$$

Then define the direct trade utility function: $H = H(p,b,v)$:

$$H(p,b,v) = V(p,g(p,v) - b) = \max [u(x): px \geq g(p,v) - (b,x) \geq 0],$$

where b represents income not directly devoted to consumption.

Differentiating (and applying Hotelling's lemma, Roy's theorem),

$$H_{pi}(p,b,v) = V_{pi}(p,m) + V_m(p,m)\, g_{pi}(p,v)$$

$$= V_m(p,m)\, e^i(p,b,v),$$

$$H_{pi}(p,b,v) = H_b(p,b,v)\, e^i(p,b,v), \qquad (1)$$

where $e^i(p,v)$ denotes the excess supply function for commodity i.

Table 10--Inverse price elasticities for Canadian-U.S. trade

Year	U.S. supply of Canadian imports: (model 1) 1/	U.S. demand for Canadian exports (model 2) 2/	
	Unrestricted model	Unrestricted model	Restricted model 3/
1953	0.0359	0.302	-0.176
1958	.0519	.483	-.129
1963	.0590	.546	-.084
1967	.0561	.404	-.039
1972	.0562	.274	-.010

1/ Commodities are capital, labor, aggregate output, and Canadian exports/U.S. imports.

2/ Commodities are capital, labor, aggregate output, and Canadian imports/U.S. exports.

3/ Competitive behavior by Canadian exporters.

Source: (7).

This suggests the possibility of estimating a flexible functional form for $H(p,b,v)$ and then calculating the supply change. However, a necessary (and sufficient) condition for existence of a consistently aggregable $u(x)$ is that preference be quasi-homothetic, as Woodland recognized (199). The potential advantage of estimating $e^i(p,b,v)$ from $H(p,b,v)$ and (1) rather than from $V(p,m)$ and $g(P,v)$ is that data on traded quantities and prices may be more detailed, accurate, and accessible than data on production and consumption of traded goods.

Coyle addresses the issue of specifying appropriate functional forms for estimation when the objective is to calculate general-equilibrium responses (56). The maintained hypothesis is that individual firms and/or consumers exhibit static, competitive behavior at equilibrium prices. Let a denote a vector of exogenously determined parameters for an industry or economy, and let $x = x(a)$, $y = y(a)$, $p^x = p^x(a)$ and $p^y = p^y(a)$ denote the corresponding general-equilibrium relations between a and industry input levels, industry output levels, and prices, respectively. Then flexible forms for the following "primal-dual" relations are specified:

$$G(a,x,y) = [(p^y(a)y(a) - p^x(a)x(a)] - [p^y(a)y - p^x(a)x]$$
$$G(a,p) = [(p^y(a)y(a) - p^x(a)x(a)] - [p^y y(a) - p^x x(a)]$$

These relations can be estimated as quasi-reduced forms for prices and commodities using linear econometric techniques in a manner somewhat analogous to standard applications of duality theory. The end results are estimators of general-equilibrium changes $x_a(a)$, $y_a(a)$, and $p_a(a)$ that are both linear in the parameters to be estimated for the functional forms and yet fully consistent with the assumption of static, competitive behavior by all firms in the industry.

CONCLUSIONS

We have tried to present a relatively compact survey of recent developments in trade gains literature. Perhaps the most obvious aspect of one survey is that it indicates the difficulty in distinguishing between a legitimate part of the trade gains literature and closely related fields in international economics. The scope of the topics covered in this survey indicate that we found the choice difficult to make, and in many instances, somewhat arbitrary, so we include in our bibliography a much more extensive list of papers than we refer to in the text. We hope this list is extensive enough to introduce most readers to closely related topics that they may wish to pursue more thoroughly.

This survey also indicates that much more research is needed even though the existing literature is already unmanageably large. This seems particularly true in two areas: empirical verification of the magnitude of existing potential trade gains, and the analysis of the effects of domestic policy alternatives on trade gains. The latter area seems particularly important for individuals interested in sectors like U.S. agriculture where the Government is highly involved. The needs in the former area are underlined by the relative dearth of empirical studies on this topic as well as the relatively primitive approaches that have been used in these studies.

Economists have not yet reached a consensus on how to go about achieving the type of empirical knowledge alluded to in the previous paragraph. A major goal of research in this area would be construction of workable, yet realistic, tools for such analysis.

BIBLIOGRAPHY

(1) Abbott, P. C. "Modelling International Grain Trade with Government Controlled Markets," American Journal of Agricultural Economics, Vol. 61, No. 1 (Feb. 1979), 22-31.

(2) Alaouze, C. M., A. S. Watson, and N. H. Sturgess. "Oligopoly Pricing in the World Wheat Market," American Journal of Agricultural Economics, Vol. 60, No. 2 (May 1978), 173-85.

(3) Allen, R., C. Dodge, and A. Schmitz. "Voluntary Export Restraints as Protection Policy," American Journal of Agricultural Economics, Vol. 65, No. 2 (May 1983), 291-6.

(4) Anderson, R. K. "The Social Cost of Input Distortions: A Comment and a Generalization," American Economic Review, Vol. 69, No. 4 (Dec. 1979), 235-8.

(5) _____, and J. Riley. "International Trade with Fluctuating Prices," International Economic Review, Vol. 17, No. 1 (Feb. 1976), 76-97.

(6) _____, and A. Takayama. "Tariffs, the Terms of Trade and Domestic Prices in a Monetary Economy: A Further Analysis," Review of Economic Studies, Vol. 48, No. 3 (July 1981), 537-9.

(7) Applebaum, E., and U. R. Kohli. "Canada-United States Trade: Tests for the Small-Open-Economy Hypothesis," Canadian Journal of Economics, Vol. 12, No. 1 (Feb. 1979), 1-14.

(8) Auquier, A. A., and R. E. Caves. "Monopolistic Export Industries, Trade Taxes, and Optimal Competition Policy," Economic Journal, Vol. 89, No. 355, (Sept. 1979), 559-81.

(9) Baldwin, R. E. "Trade and Employment Effects in the United States of Multilateral Tariff Reductions," American Economic Review, Vol. 66, No. 2 (May 1976), 142-8.

(10) _____, J. H. Mutti, and J. D. Richardson. "Welfare Effects on the United States of a Significant Tariff Reduction," Journal of International Economics, Vol. 10, No. 3 (Aug. 1980), 405-23.

(11) Bale, M. D. "Estimates of Trade-Displacement Costs for U.S. Workers," Journal of International Economics, Vol. 6, No. 3 (Aug. 1976), 245-50.

(12) _____. Adjustment in Agriculture and the Trade Act of 1974. FAER-147. U.S. Dept. Agr., Econ. Res. Serv., May 1978.

(13) _____. "Distributional Aspects of Price Intervention," American Journal of Agricultural Economics, Vol. 61, No. 2 (May 1979), 348-50.

(14) _____, and B. Greenshields. "Japan: Production and Exports of Food. An Analysis of the Welfare Cost of Protection." FAER-41. U.S. Dept. Agr., Econ. Res. Serv., Nov. 1977.

(15) _____, and B. Greenshields. "Japanese Agricultural Distortions and Their Welfare Values," American Journal of Agricultural Economics, Vol. 60, No. 1 (Feb. 1978), 59-64.

(16) _____, and E. Lutz. "The Effects of Trade Intervention on International Price Instability," American Journal of Agricultural Economics, Vol. 61, No. 3 (Aug. 1979), 512-6.

(17) _____, and E. Lutz. "Price Distortions in Agriculture and Their Effects: An International Comparison," American Journal of Agricultural Economics, Vol. 63, No. 1 (Feb. 1981), 8-22.

(18) Baron, D. P., and R. Forsythe. "Models of the Firm and International Trade Under Uncertainty," American Economic Review, Vol. 69, No. 4 (Sept. 1979), 565-74.

(19) Batra, R. The Pure Theory of International Trade Under Uncertainty. New York: John Wiley, 1975.

(20) _____. "Nontraded Goods, Factor Market Distortions, and the Gains from Trade: Reply," American Economic Review, Vol. 67, No. 3 (June 1977), 467-8.

(21) _____, and R. Ramachandran. "Tariffs, the Terms of Trade and Domestic Prices in a Monetary Economy," Review of Economic Studies, Vol. 47, No. 2 (Jan. 1980), 459-63.

(22) _____. "Multinational Firms and the Theory of International Trade and Investment," American Economic Review, Vol. 70, No. 3 (June 1980), 278-90.

(23) _____, and W. Russell. "Gains from Trade under Uncertainty," American Economic Review, Vol. 64, No. 4 (Dec. 1974), 1040-8.

(24) _____, and A. Seth. "Unemployment Tariffs and the Theory of International Trade," Journal of International Economics, Vol. 7, No. 3 (Aug. 1977), 295-306.

(25) Benson, B. L., and J. C. Hartigan. "Tariffs Which Lower Price in the Restricting Country," Journal of International Economics, Vol. 14, No. 3 (Aug. 1983), 117-33.

(26) Bhagwati, J. N., and R. A. Brecher. "National Welfare in an Open Economy in the Presence of Foreign-Owned Factors of Production," Journal of International Economics, Vol. 10, No. 1 (Feb. 1980), 103-15.

(27) _____, and B. Hansent. "A Theoretical Analysis of Smuggling," Quarterly Journal of Economics, Vol. 87, No. 2 (May 1973), 72-87.

(28) _____, and T. N. Srivivasan. "Revenue Seeking: A Generalization of the Theory of Tariffs," Journal of Political Economy, Vol. 86, No. 6 (Dec. 1980), 1069-87.

(29) _____. "Domestic Resource Costs, Effective Rates of Protection, and Project Analysis in Tariff-Distorted Economies," Quarterly Journal of Economics, Vol. 94, No. 1 (Feb. 1980), 205-9.

(30) _____. "The Evaluation of Projects at World Prices under Trade Distortions: Quantitative Restrictions, Monopoly Power in Trade and Nontraded Goods," International Economic Review, Vol. 22, No. 2 (June 1981), 385-99.

(31) _____, and H. Wan, Jr. "The 'Stationarity' of Shadow Prices of Factors in Project Evaluation, with and without Distortions," American Economic Review, Vol. 69, No. 3 (June 1979), 261-73.

(32) Bigman, D., and S. Reutlinge. "Food Price and Supply Stabilization: National Buffer Stocks and Trade Policies," American Journal of Agricultural Economics, Vol. 61, No. 4 (Nov. 1979), 657-67.

(33) Boadway, R., and J. Treddenick. "A General Equilibrium Computation of the Effects of the Canadian Tariff Structure," Canadian Journal of Economics, Vol. 11, No. 3 (Aug. 1978), 424-46.

(34) Brander, J. A., and B. J. Spencer. "Tariffs and the Extraction of Foreign Monopoly Rents Under Potential Entry," Canadian Journal of Economics, Vol. 14, No. 3 (Aug. 1981), 371-89.

(35) Brecher, R. A., and J. N. Bhagwati. "Foreign Ownership and the Theory of Trade and Welfare," Journal of Political Economy, Vol. 87, No. 3 (June 1981), 497-511.

(36) _____, and R. C. Feenstra. "International Trade and Capital Mobility Between Diversified Economies," Journal of International Economics, Vol. 14, No. 2 (May 1983), 321-39.

(37) Bredahl, M., J. Hillman, and A. Schmitz. "Rent Seeking in International Trade: The Great Tomato War," submitted to forthcoming American Journal of Agricultural Economics, 1985.

(38) Brock, W., and S. Magee. "The Economics of Special Interest Politics: The Case of the Tariff," American Economic Review, Vol. 68, No. 1 (Feb. 1978), 246-50.

(39) Brown, F., and J. Whalley. "General Equilibrium Evaluations of Tariff-Cutting Proposals in the Tokyo Round and Comparisons with More Extensive Liberalization of World Trade," Economic Journal, Vol. 90, No. 4 (Dec. 1980), 838-66.

(40) Burgess, D. F. "Protection, Real Wages, and the Neoclassical Ambiguity with Interindustry Flows," Journal of Political Economy, Vol. 88, No. 4 (Aug. 1980), 780-802.

(41) _____. "Protection, Real Wages, Real Incomes, and Foreign Ownership," Canadian Journal of Economics, Vol. 13, No. 4 (Nov. 1980), 594-614.

(42) _____. "Protection, Real Wages, Real Incomes, and Foreign Ownership: A Reply," Canadian Journal of Economics, Vol. 16, No. 2 (May 1983), 356-61.

(43) Butlin, M. W. "Protection, Real Wages, Real Incomes, and Foreign Ownership: A Comment," Canadian Journal of Economics, Vol. 16, No. 2 (May 1983), 350-6.

(44) Carter, C., N. Gallini, and A. Schmitz. "Producer-Consumer Tradeoffs in Export Cartels: The Wheat Cartel Case," American Journal of International Economics, Vol. 62, No. 4 (Nov. 1980), 812-8.

(45) _____, and A. Schmitz. "Import Tariffs and Price Formation in the World Wheat Market," American Journal of Agricultural Economics, Vol. 61, No. 3 (Aug. 1979), 517-22.

(46) _____, and A. Schmitz. "Import Tariffs and Price Formation in the World Wheat Market: Reply," American Journal of Agricultural Economics, Vol. 62, No. 4 (Nov. 1980), 823-5.

(47) Cassing, J. H. "A Note on Growth in the Presence of Tariffs," Journal of International Economics, Vol. 14, No. 1 (Feb. 1983), 115-21.

(48) Calvo, G. and S. Wellisz. "International Factor Mobility and National Advantage," Journal of International Economics, Vol. 14, No. 1 (Feb. 1983), 103-14.

(49) Chambers, R. G., and A. Schmitz. Deficiency Payments and the Gains from Trade. University of Maryland, Department of Agricultural and Resource Economics, 1984.

(50) _____, and others. "Estimating the Impact of Beef Import Restrictions on the U.S. Import Market," Australian Journal of Agricultural Economics, Vol. 25, No. 2 (Aug. 1981), 123-33.

(51) Christou, C. D., and A. H. Sarris. "The Impact on Greek Agriculture from Membership in the European Economic Community," European Economic Review, Vol. 14, No. 4 (Sept. 1980), 159-88.

(52) Clements, K. W. "Protection and Commercial Policy: Experiments with a General Equilibrium Econometrical Model," Empirical Economics, Vol. 4, No. 2 (May 1980), 135-48.

(53) Cline, W. R., and others. Trade Negotiations in the Tokyo Round: A Quantitative Assessment. Washington, DC: The Brookings Institution, 1978.

(54) Corden, W. M. "The Calculation of the Cost of Protection," Economic Record, Vol. 24, (Apr. 1957), pp. 129-48.

(55) Coyle, B. Shadow Prices and Variable Factor Prices in the Theory of Derived Demand. University of Maryland, Department of Agricultural and Resource Economics, 1985.

(56) _____. Functional Forms for Estimating Full Equilibrium Response. University of Maryland, Department of Agricultural and Resource Economics, 1985.

(57) Dardis, R. "The Welfare Cost of Grain Protection in the United Kingdom," Journal of Farm Economics, Vol. 49, No. 3 (Aug. 1967), 597-609.

(58) Dardis, R., and E. Learn. Measures of the Degree and Cost of Economic Protection of Agriculture in Selected Countries. TB-1384. U.S. Dept. Agr., Econ. Res. Serv., 1967.

(59) Das, S. P. "Optimum Tariffs on Final and Intermediate Goods," International Economic Review, Vol. 24, No. 2 (June 1983), 493-508.

(60) Das, S. P., and Seung-Dong Lee. "On the Theory of International Trade with Capital Mobility," International Economic Review, Vol. 20, No. 1 (Feb. 1979), 119-32.

(61) Dasgupta, P., and J. Stiglitz. "Tariffs vs. Quotas as Revenue Raising Devices under Uncertainty," American Economic Review, Vol. 67, No. 5 (Dec. 1977), 975-81.

(62) Dei, F. "Dynamic Gains from International Capital Movements," Journal of International Economics, Vol. 9, No. 3 (Aug. 1979), 417-21.

(63) Der, W. "Multi-intermediate-goods Trade: The Gains and the Heckscher-Ohlin Analysis," American Economic Review, Vol. 69, No. 4 (Sept. 1979), 575-86.

(64) Dixit, A., and G. M. Grossman. "Trade and Protection with Multistage Production," Review of Economic Studies, Vol. 49, No. 158 (Oct. 1982), 583-94.

(65) _____, and V. Norman. Theory of International Trade. Cambridge: England: Cambridge University Press, 1980.

(66) Dumas, B. "The Theorems of International Trade under Generalized Uncertainty," Journal of International Economics, Vol. 10, No. 4 (Nov. 1980), 481-98.

(67) Eaton, J. "The Allocation of Resources in an Open Economy with Uncertain Terms of Trade," International Economic Review, Vol. 20, No. 2 (June 1979), 391-403.

(68) _____, and A. Panagariya. "Gains from Trade under Variable Returns to Scale, Commodity Taxation, Tariffs and Factor Market Distortions," Journal of International Economics, Vol. 9, No. 4 (Nov. 1979), 481-501.

(69) Egawa, I. "Some Remarks on the Stolper-Samuelson and Rybczynski Theorems," Journal of International Economics, Vol. 8, No. 4 (Nov. 1978, 525-36.

(70) Eichengreen, B. J. "A Dynamic Model of Tariffs, Output, and Employment under Flexible Exchange Rates," Journal of International Economics, Vol. 11, No. 3 (Aug. 1981), 341-59.

(71) Emmanuel, A. Unequal Exchange: A Study of the Imperialism of Trade. New York: Monthly Review Press, 1972.

(72) Ethier, W. "National and International Returns to Scale in the Modern Theory of International Trade," American Economic Review, Vol. 72, No. 3 (June 1982), 389-405.

(73) _____. "Decreasing Costs in International Trade and Frank Graham's Argument for Protection," Econometrica, Vol. 50, No. 5 (Sept. 1982), 1243-68.

(74) _____, and A. Ray. "Gains from Trade and the Size of a Country, II," Journal of International Economics, Vol. 9, No. 1 (Feb. 1979), 127-9.

(75) Falvey, R. E. "Commercial Policy and Intra-Industry Trade," Journal of International Economics, Vol. 11, No. 4 (Nov. 1981), 495-511.

(76) Feder, G., R. E. Just, and A. Schmitz. "Storage with Price Uncertainty in International Trade," International Economic Review, Vol. 18, No. 4 (Oct. 1977), 553-68.

(77) Feenstra, R. C. "Monopsony Distortions in an Open Economy: A Theoretical Analysis," Journal of International Economics, Vol. 10, No. 2 (May 1980), 213-35.

(78) _____, and K. L. Judd. "Tariffs, Technology Transfer and Welfare," Journal of Political Economy, Vol. 90, No. 6 (Dec. 1982), 1142-65.

(79) Ferguson, D. G. "Protection, Real Wages, and Aggregate Factor Substitution," International Economic Review, Vol. 23, No. 3 (Oct. 1982), 735-43.

(80) Floystad, G. "The Potential Gains from Trade in Norway from Free Trade Arrangements with the Common Market," Quantitative Studies of International Economic Relations. Ed. H. Glejser. Amsterdam, The Netherlands: North Holland, 1976.

(81) Freebairn, J. W., and G. C. Rausser. "Effects of Changes in the Level of U.S. Beef Imports," American Journal of Agricultural Economics, Vol. 57, No. 4 (Nov. 1975), 676-88.

(82) Frisch, R. "A Complete Scheme for Comparing all Direct and Cross Demand Elasticities in a Model with Many Sectors," Econometrica, Vol. 27, No. 2 (Apr. 1959), 177-96.

(83) Fukushima, T. "Tariff Structure, Nontraded Goods and Theory of Piecemeal Policy Recommendations," International Economic Review, Vol. 20, No. 2 (June 1979), 427-35.

(84) Gabezewicz, J. J., and others. "International Trade in Differentiated Products," International Economic Review, Vol. 22, No. 3 (Oct. 1981), 527-34.

(85) Ghosh, D. K. "Optimum Tariffs in a Multi-commodity Framework," Southern Economic Journal, Vol. 46, No. 2 (Oct. 1979), 502-12.

(86) Grennes, T., and P. R. Johnson. "Import Tariffs and Price Formulation in the World Wheat Market: Comment," American Journal of Agricultural Economics, Vol. 62, No. 4 (Nov. 1980), 819-22.

(87) Haberler, G. "Some Problems in the Pure Theory of International Trade," Economic Journal, Vol. 60, No. 238 (June 1950), 223-40.

(88) Harberger, A. C. "Using the Resources at Hand More Effectively," American Economic Review," Vol. 44, No. 2 (May 1959), 134-46.

(89) Hartigan, J. C., and E. Tower. "Trade Policy and the American Income Distribution," Review of Economics and Statistics, Vol.64, No. 2 (May 1982), 261-70.

(90) Hatta, T. "A Recommendation for a Better Tariff Structure," Econometrica, Vol. 9, No. 4 (Nov. 1977), 1859-69.

(91) _____, and T. Fukushima. "The Welfare Effect of Tariff Rate Reductions in a Many Country World," Journal of International Economics, Vol.9, No. 4 (Nov. 1979), 503-11.

(92) Hayami, Y. "Trade Benefits to All: A Design of the Beef Import Liberalization in Japan," American Journal of Agricultural Economics, Vol. 61, No. 2 (May 1979), 342-47.

(93) Helpman, E., and A. Razin. "Uncertainty and International Trade in the Presence of Stock Markets," Review of Economic Studies, Vol. 45, No. 2 (June 1978), 239-50.

(94) Helpman, E., and A. Razin. "The Protective Effect of a Tariff under Uncertainty," Journal of Political Economy, Vol. 86, No. 6 (Dec. 1978), 1131-41.

(95) _____, and A. Razin. "Welfare Aspects of International Trade in Goods and Securities: An Addendum," Quarterly Journal of Economics, Vol. 94, No. 2 (May 1980), 615-18.

(96) _____, and A. Razin. "Efficient Protection under Uncertainty," American Economic Review, Vol. 70, No. 4 (Sept. 1980), 716-31.

(97) Herberg, H., and M. C. Kemp. "In Defense of Some 'Paradoxes' of Trade Theory," American Economic Review, Vol. 70, No. 4 (Sept. 1980), 812-4.

(98) Hong, W. "Distortions and Static Negative Marginal Gains from Trade," Journal of International Economics, Vol. 6, No. 3 (Aug. 1976), 299-308.

(99) Inoue, T. "A Generalization of the Samuelson Reciprocity Relation, the Stolper-Samuelson Theorem and the Rybczynski Theorem under Variable Returns to Scale," Journal of International Economics, Vol. 11, No. 1 (Feb. 1981), 79-98.

(100) Itoh, M., and R. Ono. "Tariffs, Quotas, and Market Structure," Quarterly Journal of Economics, Vol. 94, No. 2 (May 1980), 295-305.

(101) Jabara, C. L., and R. L. Thompson. "Agricultural Comparative Advantage under International Price Uncertainty: The Case of Senegal," American Journal of Agricultural Economics, Vol. 62, No. 2 (May 1980), 188-98.

(102) Johansen, L. A Multi-sectoral Study of Economic Growth. Amsterdam, The Netherlands: North Holland, 1964.

(103) Johnson, D. G. "The Impact of Freer Trade on North American Agriculture," American Journal of Agricultural Economics, Vol. 55, No. 2 (May 1973), 294-303.

(104) _____. "Postwar Policies Relating to Trade in Agricultural Products," A Survey of Agricultural Economics Literature, Vol. 1. Ed. L. M. Martin. Minneapolis: University of Minnesota Press, 1971.

(105) Johnson, H. G. "The Gains from Freer Trade with Europe: An Estimate," The Manchester School of Economic and Social Studies, Vol. 26, No. 3 (Sept. 1958), 247-55.

(106) _____. "The Gain from Exploiting Monopoly or Monopsony Power in International Trade," Economica, Vol. 35, No. 2 (May 1968), 151-6.

(107) Jones, R. W. "Income Distribution and Effective Protection in a Multicommodity Trade Model," Journal of Economic Theory, Vol. 11, No. 1 (Aug. 1975), 1-15.

(108) _____, and J. A. Scheinkman. "The Relevance of the Two-sector Production Model in Trade Theory," Journal of Political Economy, Vol. 85, No. 5 (Oct. 1977), 909-35.

(109) Josling, T. "Domestic Farm Policies and International Trade in Agricultural Goods," Trade Strategies for Development. Ed. P. Streeten. London: Macmillan, 1973.

(110) _____, and J. Hillman. Agricultural Protection and Stabilization Policies: A Framework of Measurement in the Context of Agricultural Adjustment. Rome: Food and Agriculture Organization of the United Nations, 1975.

(111) Just, R. E., and D. L. Hueth. "Welfare Measures in a Multimarket Framework," American Economic Review, Vol. 69, No. 5 (Dec. 1979), 947-54.

(112) _____, and others. "The Distribution of Welfare Gains from International Price Stabilization under Distortions," American Journal of Agricultural Economics, Vol. 59, No. 4 (Nov. 1977), 652-61.

(113) Katz, E., J. Paroush, and N. Kahana. "Price Uncertainty and the Price Discriminating Firm in International Trade," International Economic Review, Vol. 23, No. 2 (June 1982), 389-400.

(114) Khandker, A. W. "Multinational Firms and the Theory of International Trade and Investment: A Correction and a Stronger Conclusion," American Economic Review, Vol. 71, No. 3 (June 1981), 515-6.

(115) Konandreas, P. A., and A. Schmitz. "Welfare Implications of Grain Price Stabilization: Some Empirical Evidence for the United States," American Journal of Agricultural Economics, Vol. 60, No. 1 (Feb. 1978), 74-84.

(116) Kreinen, M. "Price Elasticities in International Trade," Review of Economics and Statistics, Vol. 49, No. 4 (Nov. 1967), 510-6.

(117) Krueger, A. O., "The Political Economy of the Rent-Seeking Society," American Economic Review, Vol. 64, No. 3 (June 1974), 290-303.

(118) Krugman, P. "Scale Economies, Product Differentiation, and the Pattern of Trade," American Economic Review, Vol. 70, No. 5 (Dec. 1980), 950-9.

(119) _____. "Intraindustry Specialization and the Gains from Trade," Journal of Political Economy, Vol. 89, No. 5 (Oct. 1981), 959-73.

(120) Lancaster, K. "Intra-industry Trade under Perfect Monopolistic Competition," Journal of International Economics, Vol. 10, No. 2 (May 1980), 151-75.

(121) Lapan, H. E. "International Trade, Factor-Market Distortions, and the Optimal Dynamic Subsidy: Reply," American Economic Review, Vol. 68, No. 5 (Dec. 1978), 956-9.

(122) Lawrence, C., and V. Levy. "On Sharing the Gains from International Trade: The Political Economy of Oil Consuming Nations and Oil Producing Nations," International Economic Review, Vol. 23, No. 3 (Oct. 1982), 711-21.

(123) Letiche, J. M., R. G. Chambers, and A. Schmitz. "The Development of Gains from Trade Theory: Classical to Modern Literature," International Economic Policies and their Theoretical Foundation. Ed. J. M. Letiche. New York: Academic Press, 1982.

(124) Longworth, J. W., and P. Knopke. "Australian Wheat Policy 1948-79: A Welfare Evaluation," American Journal of Agricultural Economics, Vol. 64, No. 4 (Nov. 1982), 642-54.

(125) Lucas, R. F. "Tariffs, Nontraded Goods, and the Optimal Stabilization Policy," American Economic Review, Vol. 70, No. 4 (Sept. 1980), 611-25.

(126) McCulloch, R., and J. C. Yellen. "Factor Market Monopsony and the Allocation of Resources," Journal of International Economics, Vol. 10, No. 2 (May 1980), 237-47.

(127) Magee, S. P. "The Welfare Effects of Restrictions on U.S. Trade," Brookings Papers on Economic Activity, No. 3 (1972), 645-707. Washington DC: The Brookings Institution.

(128) Mainwaring, L. "A Neo-Ricardian Analysis of International Trade," Kyklos, Vol. 27, No. 3 (1974) 537-53.

(129) Manning, R., and J. McMillan. "Public Intermediate Goods, Production Possibilities, and International Trade," Canadian Journal of Economics, Vol. 12, No. 2 (May 1979), 243-57.

(130) Markusen, J. R., and J. R. Melvin. "Tariffs, Capital Mobility, and Foreign Ownership," Journal of International Economics, Vol. 9, No. 3 (Aug. 1979), 395-409.

(131) _____, and J. R. Melvin. "Trade Factor Prices, and the Gains from Trade with Increasing Returns to Scale," Canadian Journal of Economics, Vol. 14, No. 3 (Aug. 1981), 450-69.

(132) _____, and A. Robson. "Simple General Equilibrium and Trade with a Monopsonized Sector," Canadian Journal of Economics, Vol. 13, No. 4 (Nov. 1980), 668-82.

(133) Martin, L., and A. C. Zwart. "A Spatial and Temporal Model of the North American Pork Sector for the Evaluation of Policy Alternatives," American Journal of Agricultural Economics, Vol. 57, No. 1 (Feb. 1975), 55-66.

(134) Meilke, K. D., and G. R. Griffith. "Incorporating Policy Variables in a Model of the World Soybean/Rapeseed Market," American Journal of Agricultural Economics, Vol. 65, No. 1 (Feb. 1983), 55-73.

(135) Melvin, J. R., and D. Warne. "Monopoly and the Theory of International Trade," Journal of International Economics, Vol. 3, No. 2 (May 1973), 117-34.

(136) DeMelo, J. A. P. "Estimating the Costs of Protection: A General Equilibrium Approach," Quarterly Journal of Economics, Vol. 92, No. 2 (May 1978), 209-26.

(137) Metcalfe, J. S., and I. Steedman. "A Note on the Gains from Trade," Economic Record, Vol. 51 (1974), 581-95.

(138) Minabe, N. "Tariffs, Capital Exports and Immiserizing Growth," Journal of International Economics, Vol. 11, No. 1 (Feb. 1981), 117-21.

(139) Mintz, I. U.S. Import Quotas: Costs and Consequences. Domestic Affairs Study No. 10. Washington, DC: American Enterprise Institute, 1971.

(140) Mundell, R. A. "International Trade and Factor Mobility," American Economic Review, Vol. 47, No. 2 (June 1957), 321-35.

(141) Mutti, J. "Aspects of Unilateral Trade Policy and Factor Adjustment Costs," Review of Economics and Statistics, Vol. 55, No. 1 (Feb. 1978), 102-10.

(142) _____. "Welfare Effects of Multilateral Tariff Reductions," Southern Economic Journal, Vol. 45, No. 3 (Jan. 1979), 760-72.

(143) Neary, J. P. "Dynamic Stability, and the Theory of Factor-Market Distortions," American Economic Review, Vol. 68, No. 4 (Sept. 1978), 671-82.

(144) _____. "This Side of Paradox, or, in Defense of the Correspondence Principle: A Reply to Herberg and Kemp," American Economic Review, Vol. 70, No. 4 (Sept. 1980), 815-8.

(145) Newbery, D. M. G., and J. E. Stiglitz. The Theory of Commodity Price Stabilization: A Study in the Economics of Risk, New York: Oxford University Press, 1981.

(146) Ohyama, M., and K. Suzuki. "Interindustry Flows, Non-traded Intermediate Goods and the Theory of Effective Protection: A General Equilibrium Analysis," Journal of International Economics, Vol. 10, No. 4 (Nov. 1980), 567-78.

(147) Ono, H. "Nontraded Goods, Factor Market Distortions, and the Gains from Trade: Comment," American Economic Review, Vol. 67, No. 3 (June 1977), 464-6.

(148) Ordover, J. A., and J. C. Panzar. "On the Nonlinear Pricing of Inputs," International Economic Review, Vol. 23, No. 3 (Oct. 1982), 659-75.

(149) Pagoulatos, E., A. Pagoulatos, and R. Sorenson. "Impact of Agricultural Export Trade on a State's Economy," North Central Journal of Agricultural Economics, Vol. 4, No. 2 (July 1982), 103-7.

(150) Panagariya, A. "Import Targets and the Equivalence of Optimal Tariff and Quota-Structures," Canadian Journal of Economics, Vol. 13, No. 4 (Nov. 1980), 711-5.

(151) _____. "Variable Returns to Scale in General Equilibrium Theory Once Again," Journal of International Economics, Vol. 10, No. 4 (Nov. 1980), 499-526.

(152) _____. "Quantitative Restrictions in International Trade Under Monopoly," Journal of International Economics, Vol. 11, No. 1 (Feb. 1981), 15-31.

(153) _____. "Variable Returns to Scale in Production and Patterns of Specialization," American Economic Review, Vol. 71, No. 1 (Mar. 1981), 221-30.

(154) _____. "Tariff Policy under Monopoly in General Equilibrium," International Economic Review, Vol. 23, No. 1 (Feb. 1982), 143-56.

(155) Pelzman, J., and C. E. Bradberry. "The Welfare Effects of Reduced U.S. Tariff Restrictions on Imported Textile Products," Applied Economics, Vol. 12, No. 4 (Dec. 1980), 455-65.

(156) Rausser, G. C. "Political Economic Markets: PERTs and PESTs in Food and Agriculture," American Journal of Agricultural Economics, Vol. 64, No. 5 (Dec. 1982), 820-833.

(157) _____, and J. W. Freebairn. "Approximate Adaptive Control Solutions to U.S. Beef Trade Policy," Annals of Economic and Social Measurement, Vol. 3, No. 1 (Jan. 1974), 177-203.

(158) _____. "Estimation of Policy Preference Functions: An Application to U.S. Beef Import Quotas," Review of Economics and Statistics, Vol. 56, No. 4 (Nov. 1974), 437-49.

(159) Ray, A. "Gains from Trade and the Size of a Country," Journal of International Economics, Vol. 7, No. 1 (Feb. 1977), 67-71.

(160) Riezman, R., "Tariff Retaliation from a Strategic Viewpoint," Southern Economic Journal, Vol. 48, No. 3 (Jan. 1982), 583-93.

(161) Rodriques, C. A. "The Quality of Imports and the Differential Welfare Effects of Tariffs, Quotas, and Quality Controls as Protective Devices," Canadian Journal of Economics, Vol. 12, No. 3 (Aug. 1979), 439-49.

(162) Rojko, A. D., F. S. Urban, and J. J. Naive. "World Demand Prospects for Grains in 1980 with Emphasis on Trade by Less Developed Countries. FAER-75. U.S. Dept. Agr., Econ. Res. Serv., 1971.

(163) Ruffin, R., and R. Jones. "Protection and Real Wages: The Neoclassical Ambiguity," Journal of Economic Theory, Vol. 14, No. 2 (Apr. 1977), 337-48.

(164) _____. "Tariffs, the Balance of Payments, and the Demand for Money," Journal of International Economics, Vol. 9, No. 2 (May 1979), 287-302.

(165) Saidi, N., and P. Srinagesh. "On Non-linear Tariff Schedules," Journal of International Economics, Vol. 11, No. 2 (May 1981), 173-95.

(166) Samuelson, P. A. "The Gains from International Trade," Canadian Journal of Economics and Political Science, Vol. 5, No. 2 (May 1939), 195-205.

(167) Sanyal, K. K., and R. W. Jones. "The Theory of Trade in Middle Products," American Economic Review, Vol. 72, No. 1 (March 1982), 16-31.

(168) Sarris, A. H., and J. Freebairn. "Endogenous Price Policies and International Wheat Prices," American Journal of Agricultural Economics, Vol. 65, No. 2 (May 1983), 214-24.

(169) _____, and A. Schmitz. "Toward a U.S. Agricultural Export Policy for the 1980's," American Journal of Agricultural Economics, Vol. 65, No. 2 (Dec. 1981), 832-9.

(170) Schmitz, A., and others. Grain Export Cartels. New York: Harper and Row, 1981.

(171) Schuh, G. E. "The Exchange Rate and U.S. Agriculture," American Journal of Agricultural Economics, Vol. 56, No. 1 (Feb 1974), 1-13.

(172) Shei, S. Y. and R. L. Thompson. "The Impact of Trade Restrictions on Price Stability in the World Wheat Market," American Journal of Agricultural Economics, Vol. 59, No. 4 (Nov. 1977), 628-38.

(173) _____. "The Short Run Welfare Effects of Export Controls," Canadian Journal of Agricultural Economics, Vol. 26, No. 1 (Feb. 1978), 29-34.

(174) Smith, M. A. M. "Intertemporal Gains from Trade," Journal of International Economics, Vol. 9, No. 2 (May 1979), 239-48.

(175) Srinivasan, T. N., and J. N. Bhagwati. "Shadow Prices for Project Selection in the Presence of Distortions: Effective Rates of Protection and Domestic Resource Costs," Journal of Political Economy, Vol. 86, No. 1 (Feb. 1978), 97-116.

(176) Stolper, W. F. and P. A. Samuelson. "Protection and Real Wages," Review of Economic Studies, Vol. 9 (Nov. 1941), 58-73.

(177) Suzuki, K. "The Welfare Effects of an Export Tax Levied on an Intermediate Good," Quarterly Journal of Economics, Vol. 92, No. 1 (Feb. 1978), 55-69.

(178) _____. "Nontraded Inputs, the Effective Rate of Protection and Gross Output Changes," Journal of International Economics, Vol. 9, No. 3 (Aug. 1979), 411-5.

(179) Svenson, L. E. O., "National Welfare in the Presence of Foreign-owned Factors of Production: An Extension," Scandinavian Journal of Economics, Vol. 83, No. 4 (1981), 497-507.

(180) Sweeney, R. J., E. Tower, and T. D. Willet. "The Ranking of Alternative Tariff and Quota Policies in the Presence of Domestic Monopoly," Journal of International Economics, Vol. 7, No. 4 (Nov. 1977), 349-62.

(181) Tanaka, K., Y. Sendo, and S. Kakimoto. "The Theory of Effective Protection in General Equilibrium with Interindustrial Flows," Journal of International Economics, Vol. 7, No. 4 (Nov. 1977), 343-48.

(182) Taylor, L., and S. L. Black. "Practical General Equilibrium Estimation of Resource Pulls under Trade Liberalization," Journal of International Economics, Vol. 4, No. 1 (Feb. 1974), 37-58.

(183) Thurow, L., and H. White. "Optimum Trade Restrictions and their Consequences," Econometrica, Vol. 44, No. 4 (July 1976), 777-86.

(184) Thursby, M., and R. Jensen. "A Conjectural Variation Approach to Strategic Tariff Equilibria," Journal of International Economics, Vol. 13, No. 1 (Feb. 1983), 145-61.

(185) Tower, E. "The Optimum Incentive-Schedule Tariff," Canadian Journal of Economics, Vol. 11, No. 4 (Nov. 1978), 726-33.

(186) _____, A. Sheer, and H. J. Baas. "Alternative Optimum Tariff Strategies as Devices for Transferring Real Income," Southern Economic Journal, Vol. 44, No. 3 (July 1978), 18-31.

(187) Travis, W. P. "The Aggregative Analysis of Gains from International Investment and Trade," Quantitative Studies of International Economic Relations. Ed. H. G. Glejser. Amsterdam, The Netherlands: North Holland, 1976.

(188) Turnovsky, S. J. "Technological and Price Uncertainty in a Ricardian Model of International Trade," Review of Economic Studies, Vol. 41, No. 2 (Apr. 1974), 201-17.

(189) Uekawa, Y. "The Theory of Effective Protection, Resource Allocation and the Stolper-Samuelson Theorem: The Many Industry Case," Journal of International Economics, Vol. 9, No. 2 (May 1979), 151-71.

(190) _____. "A Non-traded Input, Substitution and Effective Protection," Journal of International Economics, Vol. 10, No. 4 (Nov. 1980), 579-92.

(191) Ulph, A. M., and G. M. Folie. "Exhaustible Resources and Cartels: An Intertemporal Nash-Cournot Model," Canadian Journal of Economics, Vol. 17, No. 4 (Nov. 1980), 645-58.

(192) U.S. Department of Agriculture, Foreign Agricultural Service. "Agricultural Trade and the Proposed Round of Multilateral Negotiations. Series No. 94-582-73-3. Apr. 1973.

(193) Warr, P. G. "On the Shadow Pricing of Traded Commodities," Journal of Political Economy, Vol. 89, No. 3 (Aug. 1977), 865-72.

(194) Weymark, J. A. "Welfare Optimal Tariff Revenues and Maximum Tariff Revenues," Canadian Journal of Economics, Vol. 13, No. 4 (Nov. 1980), 615-31.

(195) Whalley, J. "Discriminating Features of Domestic Factor Tax Systems in a Goods Mobile-Factors Immobile Trade Model: An Empirical General Equilibrium Approach," Journal of Political Economy, Vol. 88, No. 4 (Dec. 1980), 1177-1202.

(196) Wipf, L. J. "Tariffs, Nontariff Distortions, and Effective Protection in U.S. Agriculture," American Journal of Agricultural Economics, Vol. 53, No. 4 (Aug. 1971), 423-30.

(197) Wong, K. Y., "On Choosing Among Trade in Goods and International Capital and Labor Mobility," Journal of International Economics, Vol. 13, No. 2 (May 1983), 223-50.

(198) Wonnacott, P., and R. Wonnacott. "Is Unilateral Tariff Reduction Preferable to a Customs Union? The Curious Case of the Missing Foreign Tariffs," American Economic Review, Vol. 71, No. 3 (Sept. 1981), 704-14.

(199) Woodland, A. D. "Direct and Indirect Trade Utility Functions," Review of Economic Studies, Vol. 47, No. 5 (Oct. 1980), 907-26.

(200) _____. "Stability, Capital Mobility and Trade, "International Economic Review, Vol. 24, No. 2 (June 1983), 475-83.

(201) Yeager, L. B. "The Size of Gain from an Optimum Tariff," Southern Economic Journal, Vol. 30, No. 4 (Oct. 1964), 140-8.

(202) Yeh, Y. H. "Factor Inflows, Trade and Income Distribution in the Presence of Domestic Distortions," Atlantic Economic Journal, Vol. 10, No. 4 (Dec. 1982), 60-6.

(203) Young, L. "Ranking Optimal Tariffs and Quotas for a Large Country Under Uncertainty," Journal of International Economics, Vol. 9, No 2 (May 1979), 249-64.

(204) _____. "Optimal Revenue-raising Trade Restrictions under Uncertainty," Journal of International Economics, Vol. 10, No. 3 (Aug. 1980), 425-39.

(205) _____, and J. E. Anderson. "The Optimal Policies for Restricting Trade Under Uncertainty," Review of Economic Studies, Vol. 47, No. 5 (Oct. 1980), 927-32.

(206) _____. "Risk Aversion and Optimal Trade Restrictions," Review of Economic Studies, Vol. 49, No. 2 (Apr. 1982), 291-306.

(207) Young, L., and M. C. Kemp. "On the Optimal Stabilization of Internal Producers' Prices in International Trade," International Economic Review, Vol. 23, No. 1 (Feb. 1982), 123-41.

(208) Zwart, A. C., and K. D. Meilke. "The Influence of Domestic Pricing Policies and Buffer Stocks on Price Stability in the World Wheat Industry," American Journal of Agricultural Economics, Vol. 61, No. 3 (Aug. 1979), 434-45.

UNITED STATES DEPARTMENT OF AGRICULTURE
ECONOMIC RESEARCH SERVICE
1301 NEW YORK AVENUE, N. W.
WASHINGTON, D. C. 20005-4788